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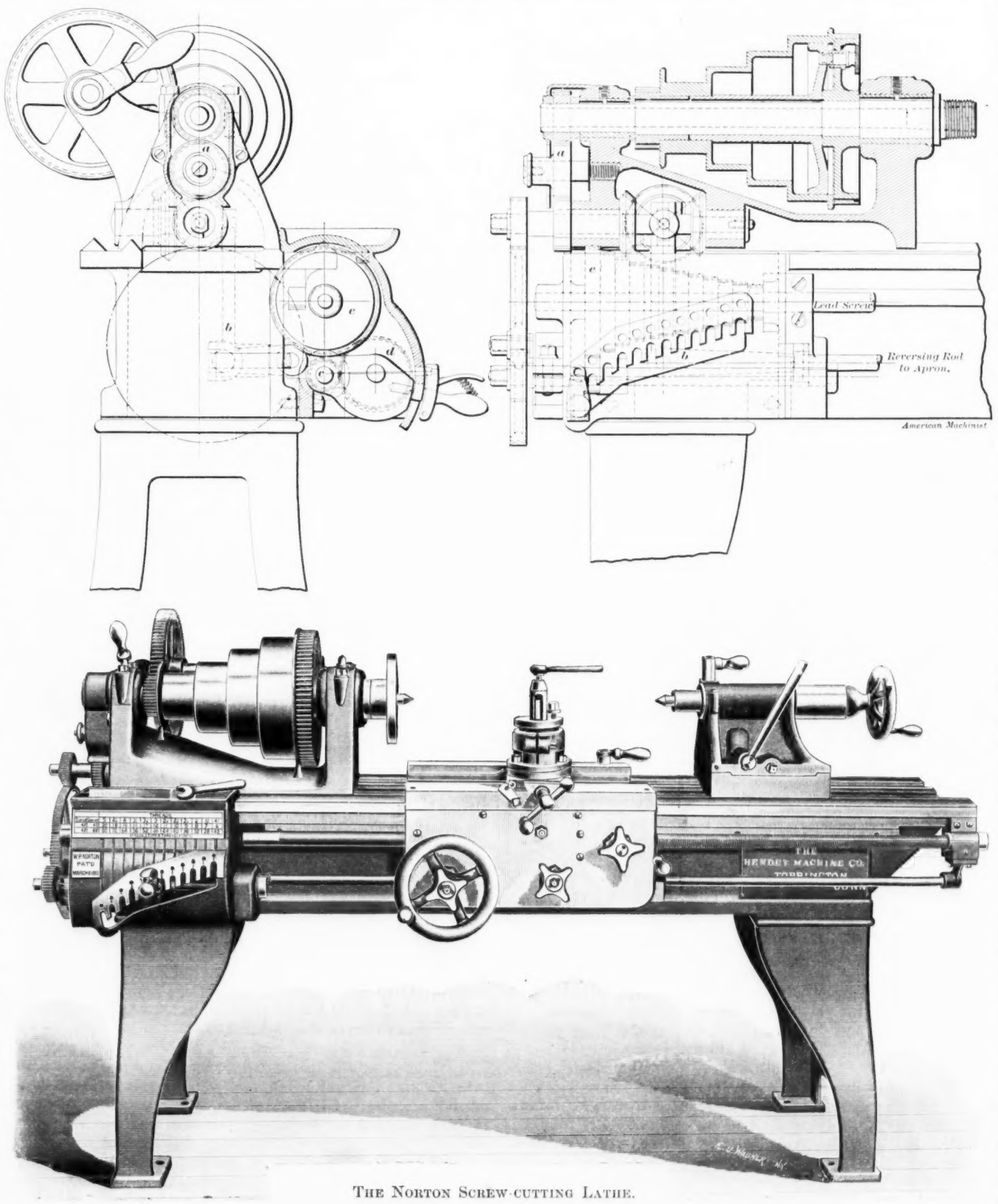
The Norton Screw-cutting Lathe.

In our issue of March 24, 1892, we illustrated a method of arranging the change gears of a lathe so that any one of them would be at once available for changes by the simple movement of a lever. This, as we stated at the time, is the invention of Mr. W. P. Norton, who has since become superintendent of the shops of the Hendey Machine Company, at Torrington, Conn., who are now building a high-grade lathe which we herewith illustrate, and of which the device referred to forms an important part. We give a general view of the lathe and also some views made from working drawings, which will make the construction and method of operation easily understood.

It will be noticed that the pinion which drives the gear train is outside the rear bearing and engages with an intermediate (*a*) which can be shifted on the fixed stud so as to stop all the gears when desired. The gear below with which gear *a* engages is keyed to a sleeve which passes through a bearing in the head, and at the other end carries a bevel gear which forms part of the well-known bevel gear and double clutch reversing device, the stud which is driven by the clutch passing through the center of the sleeve before referred to.

The clutch is operated by means of the bell crank *b* which is shown in dotted lines within the bed, this being in turn operated by a lever which is attached to the end of the rod running along the bed, behind the carriage apron, where there is a handle splined to it, by moving which the motion of the screw and carriage is reversed. This is done within half a revolution, owing to the fact that the lugs on the two bevel gears are placed diametrically opposite each other, and, there being but one lug on each gear, while the stud turns at the same speed as the spindle, the thread is always correctly engaged regardless of its pitch.

This reversing device is not new, but is not generally used; it forms no essential part of the other improvements upon the lathe, but has been adopted in the belief that for many jobs of screw cutting it is the most convenient and quickest method of reversing. Both the other and more common methods of running the carriage back are provided for, *i. e.*, there is a reversing countershaft, and the lead-screw nut opens and closes quickly by a cam, so that it may be opened for running the carriage back where the length of the screw being cut, or its pitch relative to that of the lead-screw, make this most advantageous. For short screws of small diameter the special reversing device has a decided advantage, not the least of which is that it allows a much easier position of the workman.



THE NORTON SCREW-CUTTING LATHE.

The gears at the end of the lathe below the reversing stud can be changed the same as on any other lathe to get pitches or rates of feed not provided for by the fixed change gears, and instead of driving the screw direct they drive a short shaft (*c*) which is placed below the screw, and has a bearing at each end of the case in which the gears are placed. This shaft is splined and has a sleeve fitted to it, to which is keyed a pinion that is always in engagement with the intermediate *d*. This intermediate is journaled in a lever by which both it and the pinion are moved along the shaft *c* opposite any desired change gear; all of these latter being keyed permanently to the lead-screw. The intermediate *d* is thrown into engagement with the desired change gear by an upward movement of the lever which is locked by the spring latch shown. This latch engages with the holes shown in front of the case when the gears are in engagement, and with the top of the notches when out of engagement, thus locking it in either position. The notches serve to guide and hold the lever to its proper position, while a table above indicates the pitch of the screw which the lathe will cut. There are twelve gears keyed to the screw, which provides for most of the pitches cut in every-day practice, while for pitches outside of this range a change of one gear at the end of the lathe in the ordinary manner gives, instead of only one new pitch, twelve. Two changes are regularly provided for, one of these being for pipe threads—11½ per inch.

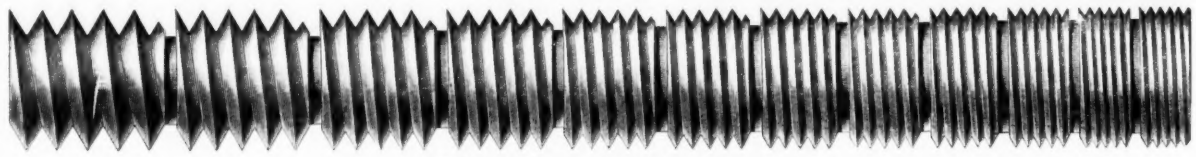
A worm splined to the lead-screw gives the feed; the rate of feed being in each case one-fifth that of the screw pitch, as given by the table.

Aside from the convenience of this arrangement, it will be noticed that by it the gears can never be mislaid, and that they are effectually protected from dirt and dust as well as from accidental injury. The top of the case in which they are placed forms a convenient shelf for wrenches and other tools, and, by removing two small screws, it can be lifted off, exposing the gears to view.

During a recent visit to the works the writer had an opportunity of handling one of the lathes and cut some screw threads

upon it. It was found that the change from one pitch to another was made about as readily as the feed of the ordinary lathe is reversed, and it is done without stopping the lathe and without jar or clatter. The lathe looks well, and the casing is not in the least in the way, projecting as it does scarcely more than the hand-wheel on the carriage. The multiple threaded screw, shown on this page, was cut entire without stopping the lathe for any purpose.

As to the rest of the lathe, it will be noticed that it is proportioned in accordance with modern ideas. The steel spindle has ground journals running in phosphor bronze bearings, which are also ground inside and out. The carriage has a long bearing upon the shears; automatic cross feed; improved raise and fall rest, and can be furnished with compound rest or taper attachment. Foot stock is clamped by an eccentric. The engraving is of an 18″ lathe; 16″ and 14″ are also being made. As to the workmanship—the methods pursued in building these and other tools at the Hendey shops, we shall have something to say in a future issue.



Screw Cut by Norton Lathe.

How to Repair Broken or Cracked Castings—I.

By S. Bolland.

To say that more than half the attempts to repair castings by the process of "burning" are failures, is by no means a random statement, and there are large numbers of intelligent molders with practical experience in this somewhat abused branch of the trade, who are convinced of its truth.

How it is that failures occur so often does not always strike the average molder, and he is forced to retire from his sometimes self-imposed task as gracefully as he knows how, and find consolation for his wounded pride behind that oft-quoted refuge of the ignorant, viz., "It can't be done." But this is only another proof, added to the many already adduced, that our education comes far behind in matters of this description, and we must, for some time longer at least, continue to grope in the dark.

If past experimenters in the art of burning had been more intelligent, the list of failures would most unquestionably not have been as numerous; for the simple reason that, possessing a knowledge of the nature of such undertakings, impossibilities would have been more rarely attempted. They would have at once consigned to the scrap pile most of the defective castings, *knowing* that any attempt at *burning* must inevitably result in a waste of time and ultimate loss.

Even when the advisability of attempting a "burn" is left to the judgment of the most scientific amongst us, there is a lack of positiveness in his utterances and manner. He is well aware of the countless circumstances which are against success, and takes care to supplement his grave advice by quoting a few of the adverse possibilities in the case, and invariably ends by asking his more practical associate how similar cases have resulted in his past experience.

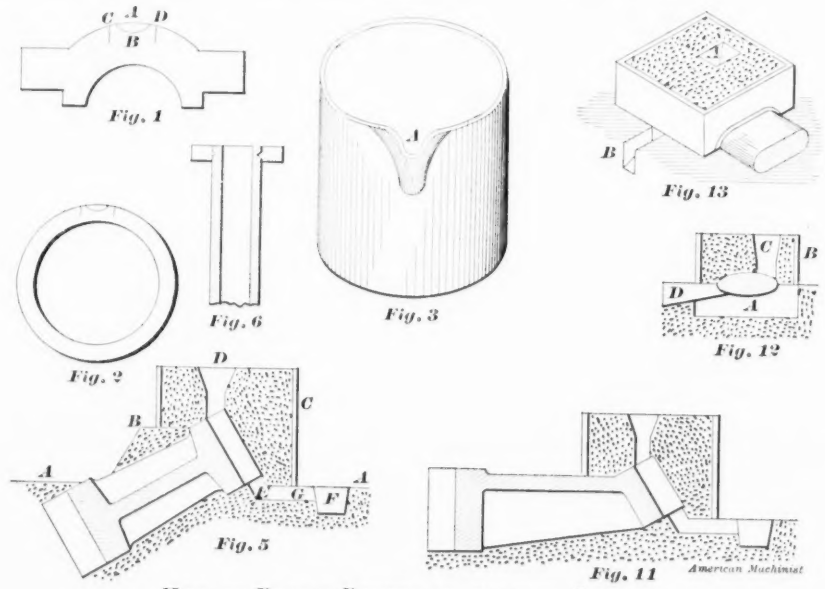
It may be well to observe here, that past experience in this business is not by any means to be always taken as reliable data. Difference in construction and proportion of parts, one casting from another, are easily overlooked in similar castings, making them, whilst similar, not alike. Quality and nature of the iron contained in the castings are sure to differ, and even should these conditions approximate somewhat, there may be structural differences, caused by the different temperature of the metal with which the castings were poured; in one instance, hot and fluid, giving homogeneousness and strength, and in the other, dull and sluggish, with the resulting overlapping cold shuts, and all the other weakening influences incident to cold pouring.

Before attempting to repair any important casting by burning, consider well its general make-up, the variations of form, differences of thickness, rigidity, general or only partial, then think how this is going to be affected by the extreme heat which must be applied to the parts in the immediate vicinity of the place to be fused.

Expansion is an irresistible force, and just as soon as this extreme heat is imparted to one part of the casting, the adjacent parts are acted upon at once; if there is sufficient elasticity in the general make-up of the casting to allow of this thrust taking place without fracture, there is a possibility of its resuming its original shape when contraction takes place. This is the difficulty met with when it is attempted to join together, by fusion, the cracked arms of wheels, bed plates broken in mid-section, cracks or holes in cylinders, condensers, etc.

The mere fact of fusing the fractured surfaces, and thus joining the broken ends together by leaving a quantity of molten iron between, is very easy of accomplishment on fairly soft iron, but to avoid the dangers consequent on the operation of doing this is a difficulty not to be overcome so easily.

Now, if it were safe and practicable to heat all castings to be burned, up to nearly melting point, and then fuse the fractured parts instantly, the dangers from imperfect fusion or breakage would be reduced to a minimum; but all who have had any real experience in this unsatisfactory phase of the molders' art, know how almost impossible it is to meet all these conditions. Just in proportion as these conditions fail of being met will the measure of success be.



How to Repair Broken or Cracked Castings.

The above considerations, taken in conjunction with the fact that the parts melted must become, when cold, as much smaller as their full amount of shrinkage measures, whilst the remaining parts, no matter how much the casting may have been expanded by the regularly employed methods of heating, do not shrink as much by fully 75 per cent., will explain why it is next to impossible to successfully accomplish such jobs when the fracture is remote from the extremities of the casting.

When the fracture is at the extremities, as at the corners of plates, pieces of propeller blades, etc., or when two whole sections are to be attached either by fusing the broken pieces together, or by casting on a new piece entirely, as in fractured shafts, rolls, etc., all difficulty ceases. These latter, having freedom endwise for expansion, leave nothing to be done except to make sure of a perfect fusing of the broken surfaces, whilst in the previously mentioned instances, differences in degree of temperature, caused by unequal distribution of parts, with the consequent unequal expansion, are sometimes sufficient in themselves to produce disaster from breakage. This danger is supplemented by the before-mentioned fact that, inasmuch as there are differences in the amount of shrinkage betwixt the new parts and the old, there always remains this important factor, that if the parts immediately adjacent to the added metal are held rigid by the strength of those behind them, they cannot possibly follow up the full shrinkage of the new metal, and a forcible separation must therefore take place.

Aside from this, should the rigidity spoken of not exist, the internal strains produced may act with such force upon the unequally distributed metal as to rend the casting asunder at its weakest place.

Two good illustrations of the difficulties we have been discussing are shown at Figs. 1 and 2. The pillow block cap, Fig. 1, being 6 inches thick, a rising head, 4 inches diameter, was placed at *A*, and accidentally broken off whilst hot, tearing out a portion of the casting, as shown at *B*. The party in charge insisted upon burning at once, and proceeded to demonstrate his ability by first heating the casting red hot, placing a core around the damaged part and pouring about 1,500 pounds of blazing hot iron direct upon it, working the surface with a bent rod during the operation of pouring. So far as melting the surface was concerned he was eminently successful, the result being a hole over 3½ inches deep, and about 7 nches diameter. After the superfluous iron had been removed, and the surface well filed, I examined the job critically, and found that the above conclusions were verified unmistakably; the newly added metal had very perceptibly shrunk away from the rigid walls of the casting, forming a core of metal more or less disconnected at the sides, as shown at *C, D*. It was not until oil had been allowed to run into the fissure and had been again attracted to the surface by rubbing soft chalk over it, that my friend could believe such a thing, although, to a willing mind, the fact was plain to the sight before recourse was had to the latter mentioned aids.

It will be plain from the above, that it is always desirable to limit the area of new metal, and thus lessen the total shrinkage, by ceasing to pour as soon as the fusion is effected.

Fig. 2 shows end section of a 24-inch cylinder 1½ inches thick; any attempt to mend such places by these means invariably ends as shown.

It may be asserted by some that it is a common practice to successfully (?) burn holes in round and square columns, and even to attach lugs and brackets by this means, but I am very much afraid that if the results were carefully looked for by a responsible party, most of such attempts would be found more or less faulty, and that the extent of damage done would be always in proportion to the amount of new iron introduced.

One reason why so much of this class of work passes muster is, that the paint effectually hides the fault from sight, and there being no subsequent trial by pressure from steam, air, water, etc., the extent of such damage is never ascertained unless the casting should collapse when the load comes on.

I have in mind an eminent structural engineer and iron manufacturer, whose belief in the truth of the above is so strong, that he will not allow burning to be practiced on any casting which will be called upon to sustain a constant load.

There is no doubt that risks are taken oftentimes with apparently satisfactory results, but this does not prove the case, and it is always safest to try again whenever there is a doubt in the case. In fact, taking into consideration the amount of time and labor in transporting, heating, and all the subsequent manipulations entailed by a "big burning job," it is in the end made almost as costly an operation as molding over again; to say nothing of the probabilities of failure always attendant upon such efforts.

For the successful treatment of such castings as are considered safe to operate upon by the process of burning there are some few conditions which are indispensable to the production of a correct job. If the casting to be operated upon is very hard the chances for success are materially lessened; the brittleness of hard iron being proportionate to its hardness, this latter objection must be added to the difficulty of effecting perfect fusion. *The softer the iron the more readily will it fuse.*

The same may be said with reference to the iron used for burning with, if the iron used for burning be hard it loses its heat rapidly, and so conduces to failure in effecting a junction by its inability to cut into the surface acted upon; whilst soft iron with its carbon principally graphitic is more fluid and retains its heat for a longer time. *The hotter the iron the more speedy and effectual is the operation.*

All surfaces to be operated upon should be cleansed thoroughly from every particle of foreign matter, such as sand, grease, etc. If there is any doubt whatever, let a new surface be formed by chipping, drilling, filing or any other way that will aid in presenting a pure, raw surface to the action of the molten iron.

Open burning along a crack is wonderfully expedited by having one lip, at least, of the pouring ladle made after the manner shown at *A*, Fig. 3; very many failures are attributable to the mean appliances provided. A self-acting skimmer, the surface of the iron protected from the action of the air by 2 inches of charcoal, and a ladle lip, like the one shown, will give good results invariably.

As before stated, there is but one rule in regard to heating the castings to be burned, that is, to make them as hot as practicable for working around. In order to accomplish this as near as possible, make all the necessary preparations beforehand; let the new portions of mold, cakes, cores, runners, etc., be made in loam or dry sand of hard, tough texture, and, remembering that the casting will be hot, be sure to provide for a quick and easy adjustment of all the pieces by a judicious paring of the joining parts, so that everything will fit at once, and no time be lost. The pieces thus prepared can be dried during the time the casting is being heated.

It is always advisable to adopt a method of slow cooling or annealing after the operation of burning is performed; a very

good place for this purpose is the oven when it can be spared conveniently; in fact, with all castings having complicated parts some method of annealing is indispensable. *The slower they are cooled the better.*

Adjustable Bevel Band Saw Machine.

We present herewith an illustration of an improved band saw machine, designed especially for convenience in handling heavy work which is to be sawn at an angle, the table, however, always remaining level, thus doing away with the difficulty experienced in handling heavy work upon an inclined table.

In this machine the upper part of the frame (which is of hollow rectangular section) forms an arc of a circle, the center of which coincides with the center of the lower shaft, and the upper shaft and wheel are mounted upon a carriage which travels upon this arc by means of worm gearing and a rack and pinion. Thus not only is any adjustment desired always maintained without the necessity for clamping, but where the work requires a varying bevel, as is sometimes the case with ship timbers and other work, it is entirely practicable to vary the angle as the work is fed to the saw.

The upper wheel is adjustable for saw blades of different lengths by a hand-wheel and screw, and interposed between the screw and the shaft box is a rubber spring which maintains an even tension and possesses the important quality of being able to yield very quickly and relieve the saw in case a chip or any other obstruction imposes an extra strain upon it. This a weight cannot do because of its inertia.

The saw is provided with the improved guide, which we have illustrated in our issue of June 16, 1892. Table is of iron, and where it is to be used for very heavy work is provided with rollers. The wheels are covered with rubber which is vulcanized upon them, and will consequently remain in place. The wheels are 40 inches diameter; height of sawing space 16 inches; total height 8 feet 6 inches; width when set at 45 degrees (the extreme angle) 8 feet 9 inches; weight about 2,000 pounds. Several of these machines are in use by the United States government in various navy yards. They are made by P. Pryibil, 498 to 510 West 41st street, New York City.

Improved Slide Gauge.

We present with this an outline view of a slide gauge, which is made either with vernier or plain graduations, usually with $\frac{1}{100}$ths on one side of the beam and the ordinary graduations on the other.

When the graduations are to be read without a vernier, and by the sharp edge at the front of the sliding jaw, a part of this edge is cut away in the manner shown, so that the edge of the notch can be placed exactly over the center of the graduation, which is not so readily done where the head covers part of the line over its entire length. This will be recognized as an important improvement, adding much to the convenience of reading and to the accuracy with which settings can be made.

The projection on the lower side of the sliding jaw at the back is a convenience, where, for any reason, it is desirable to adjust and use the tool with one hand, as in taking measurements for sketching, or in places where there is little room to work.

The jaws are hardened and ground, and at the ends are just $\frac{1}{8}$" thick (both together), so that this amount added to any reading gives the inside measurement.

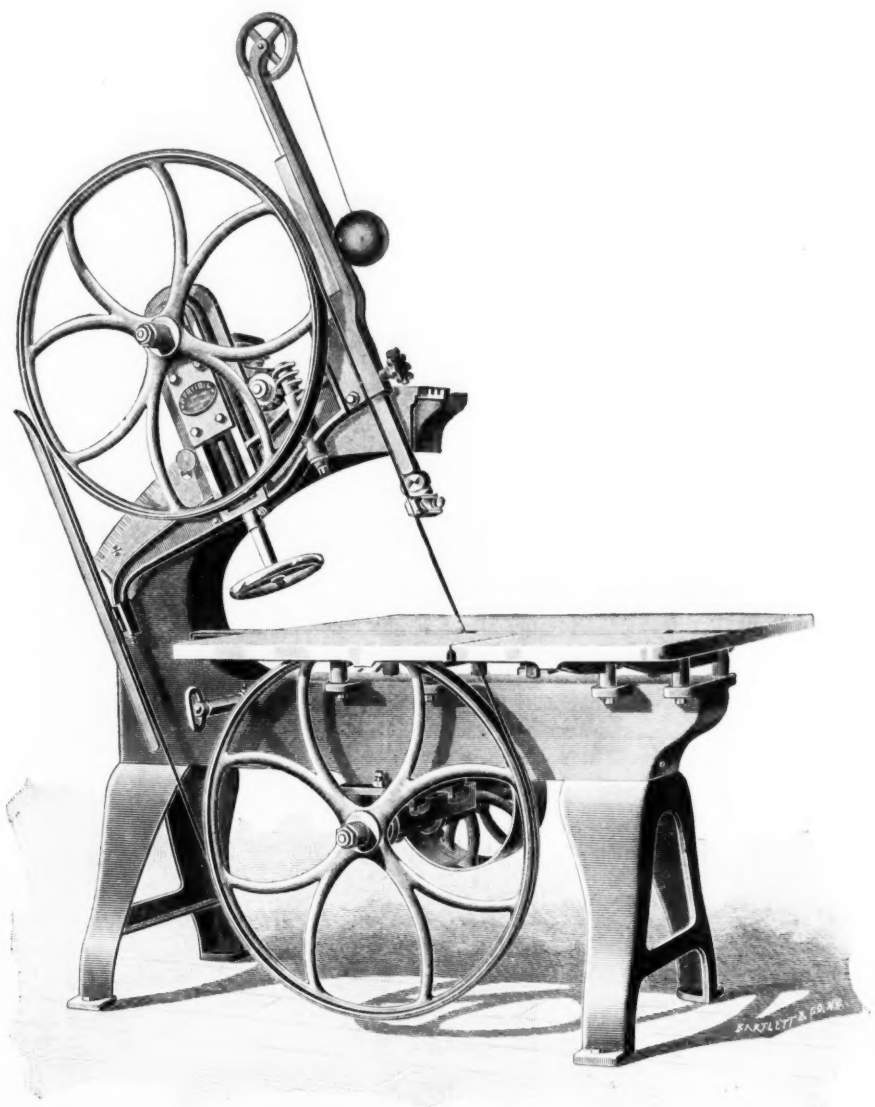
The outer end of the beam is in each case hardened and made some whole number of inches in length, so that it may be used as a depth gauge by reversing the sliding head on the beam. This beam is, of course, rectangular in section, and not oval, as our engraver has indicated.

The tool is made in any desired proportion or with any desired graduation, including metric, five sizes being regularly manufactured by E. G. Smith, Columbia, Pa.

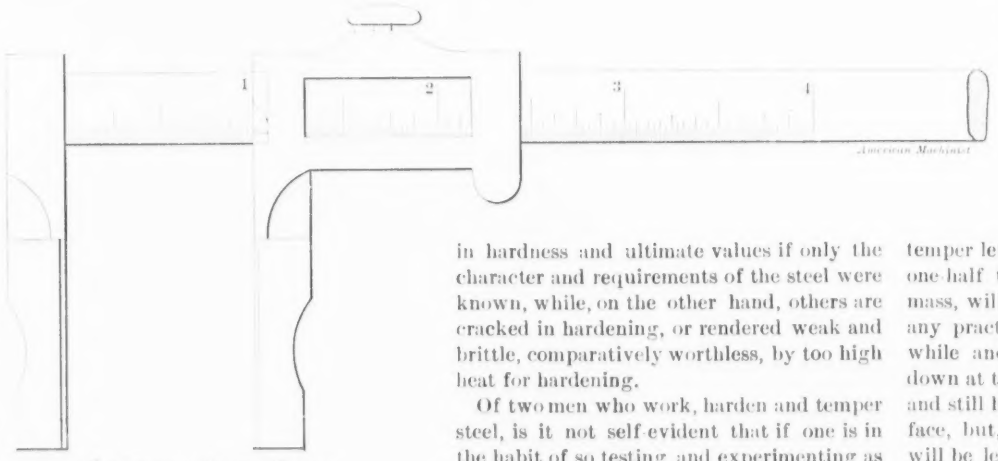
About Steel.

BY S. W. GOODYEAR.

In spite of alleged "fatigue" on the part of some writers, occasioned by the "much which has been written about steel," I still feel like imposing upon yourself and readers who may possibly not yet have been "made tired," to the extent of attempting to cast some light upon the much discussed question why certain brands of steel are all right in the hands of some, and all wrong in the hands of others. Just here comes into consideration the very thing which one of your most interesting contributors says "makes him tired." What? Why, the much in print which teaches that steels, good steels, too, admirably adapted to the several uses for which each is intended, may differ from each other so much as to require difference in treatment. It does not follow that difference in steel implies different brands or trade-marks. Two steels as judged by their every working quality may be exactly alike, and still one may be of English, and the other of American manufacture, while from the works producing either of the two could be had steel bearing the same brands, but so entirely different in character as to demand different treatment, without which they would prove comparatively worthless.



ADJUSTABLE BEVEL BAND SAW MACHINE.



IMPROVED SLIDE GAUGE.

Readers of the AMERICAN MACHINIST will doubtless remember that the writer has persistently placed before them the importance of steel workers, those in particular who harden and temper, becoming familiar with the character and requirements of each steel which comes into their hands for treatment, and as an infallible means of learning what is proper treatment, proper degree of heat for hardening, has advised that experiments be made, *i. e.*, that pieces of each variety or temper of steel be hardened and broken, thus testing for hardness, tenacity, and refined condition. Why should this advice make anybody tired? Is it not better to spend a few minutes now and then in this way than to "go it blind"? Every hour there are failures to harden costly tools for lack of the little more heat which steel of rather low temper demands, and which might be given safely and with good results in hardness and ultimate values if only the character and requirements of the steel were known, while, on the other hand, others are cracked in hardening, or rendered weak and brittle, comparatively worthless, by too high heat for hardening.

Of two men who work, harden and temper steel, is it not self-evident that if one is in the habit of so testing and experimenting as to become thoroughly acquainted with each steel he uses, and varies the treatment as required, hardening some at an orange color, and others at a dark red, always aiming to get the greatest degree of hardness compatible with utmost tenacity, and a grain when fractured as fine as flint, will succeed better than the other man who, assuming to know what is proper heat at which good steel should harden, and so is made tired by any suggestion that different tempers, different percentages of carbon, demand different heats, goes right along in his wisdom, and condemns all steel which cannot adapt itself to his treatment?

What is there in all this? Now I don't mind telling the boys, the new readers of the AMERICAN MACHINIST, apprentices, who are always ready to try experiments. Get two pieces of steel of different make, and the chances are that carbon will vary sufficiently for the purpose. Heat and harden an end of each at the same degree of heat. Now break them. If one is refined, is very difficult to break, and is very fine, and the other is coarse when broken, it will indicate that one, the refined one, had the right heat, while the other, made coarser by hardening, was heated too hot, although no hotter than the other. Why too hot? Simply because being of higher temper, higher carbon percentage, it would not stand the heat which was right for the other. Now, learn at what heat this steel of highest temper will be put at its best, *i. e.*, be thoroughly hardened and refined, that is, the grain be made finer by hardening, strength being increased rather than diminished, and then try hardening at *this lower heat* the piece which was made exactly right by the first experiment. It will not harden at that heat sufficiently to be of any practical use. Its temper, carbon percentage, is too low for the heat. Both may be good when so hardened as to be at their best. To learn how to put them at their best is of utmost importance.

A word just here. Don't confound the term "high temper" with high grade, or high quality. They do not necessarily have the least connection. A steel of low grade, of cheap inferior quality, may be of highest temper, and *vi e versa*. Steels of different sizes and shapes, for different uses, from same makers, of same grade, *i. e.*, quality, are furnished of different tempers as found to be best, on the one hand, and most safe and practicable on the other. But enough of this or somebody will get tired again.

Hardening quality in steel is too often judged of by tests which do not deal with the *real* steel, but only with its bark, or envelope, which has been let down in carbon in process of manufacture, or by annealing. What do I mean? I mean that every bar of tool steel or die block, or other forging intended to be hardened, has a bark or skin which it is just as necessary to remove to get down to *true hardening steel*, as it is to remove the bark from a tree to get to true, reliable timber. Now some of you know this. Some will dispute it, except as applied to some particular steel. Some will dispute it altogether, but it is one of those ugly facts from the existence of which we have all suffered. "Soft spots in steel," "irregular hardening." Most of us have seen their dire effects, and have heard the steel blamed, when the real trouble lay in removing too little of the decarbonized or deteriorated surface—the bark. Of course, the amount removed is never alike at all points, and those places which are "*only just skinned*" show up on hardening as soft spots.

"Some steels don't act this way, but harden hard clear to the surface," does somebody say?

Yes, and no. A steel of low temper let down in carbon at the surface to one-half the real carbon percentage of the mass, will not harden sufficiently to be of any practical use, perhaps, at the surface, while another of high temper may be let down at the surface in the same proportion, and still be said to harden well at the surface, but, mark you, the degree of hardness will be less than the true steel under it is capable of, just in proportion as the surface falls short of the true temper, and the rule applies exactly the same. If steel of 1.50 carbon is used it is presumably because steel of so high temper is desirable. Now, is it showing good judgment to remove so little from the surface as to really use for the working part of tool or die steel of .75 or .80 carbon, when another chip off, or a heavier cut in the first place, would carry you down to the real carbon, 1.50, with the added advantages of greater hardness, sure harden-

ing at lower heat, greater tenacity, finer grain, less risk of breakage, greater service, in fact, giving you all there is in the steel? Please kindly look into this matter, and you will learn that it is not simply an opinion, but a fact, and that back of it lie thousands of failures. Dies with soft spots; taps, drills, reamers, milling cutters, etc., etc., with soft sides; parts where enough was removed hardened all right; parts which were "only just cleaned" wore soft, did not harden.

Annealing steel, how? Heat thoroughly, evenly, heat through, cool slowly. Heat how? There's the rub. If it is one piece or a few pieces, heat almost any way that is convenient, and bury in charcoal dust, ashes, sawdust, any good way to cool off slowly. "But here are thousands of pieces we have to anneal," says a reader, "and we must have a quicker method. We pack in a case with alternating layers of fine charcoal, and heat in a furnace. Messrs. Brown & Sharpe, of Providence, R. I., furnish exactly the right sort of furnace." *Good.* This furnace *is all right;* has been worked up through continued use to possibly a state of perfection; but does its use insure proper annealing of steel when packed in the way referred to? Not at all. All of the contents of the case can be ruined by too much and too long-continued heat; part can be ruined by too much heat, and part be insufficiently annealed from the heat not penetrating to the inner layers. All these failures are easily reached, not so easily prevented. The work is out of sight. If to bring the case in which it is packed to proper annealing heat would insure success there would be no trouble. But this might be done and the case cool down without perceptible effect upon the contents; has been often. To insure carrying the proper heat clear through the mass of non-conducting material in which the steel is packed requires much time, and while there is, no doubt, admirably good annealing done by this old-fashioned, orthodox method, considered by so many to insure the ideal condition of annealing, there is not the slightest doubt but thousands of readers are this very day wrestling with the dire results of improper box annealing, on the one hand in destruction of valuable tools in attempting to work steel insufficiently annealed, and on the other in waste of time in making tools of otherwise good steel which have been virtually ruined by too high heat and too long-continued heat in annealing. I had my attention called recently to a lot of tools made from such steel, coarse, brittle, weak At no heat at which they could be hardened, at no temper to which they could be drawn, did they possess even a small fraction of the good quality which the steel rightly treated was capable of showing. "Faulty hardening?" "No." "Faulty annealing?" "*No, sir, can't be possible;* that steel was packed in a case with alternating layers of charcoal, and heated *carefully* in a furnace, and *it could not be injured in that way.* Why look at the surface, man, don't you see that it is not scaled? Not even pitted in the slightest degree; you can't hurt steel by overheat without scaling it." "*Yes, you can ruin it* and not scale it if it is kept from the air, and this steel is unimpeachable evidence." "Annealing did not do it; it was so before." "Impossible; steel could not come from the manufacturer's rolls or hammers in this condition; could not be made to order if wanted." Was either of us convinced to the extent of admitting his error? Not at all. But here was a fact, the steel was practically worthless. "Why?" That was the only point of disagreement. Does somebody say, "Don't tire us further, we don't need to be told all this, everybody knows all about it. If you know any better way give it to us?" Very well, now don't we all know if we heat steel to *proper heat* and cool it *slowly*, sufficiently slowly, it will be annealed? "Heat how?" Well, in charcoal, coke, anthracite, bituminous coal fire, in furnace or kitchen range, or under the boiler, anywhere, anyhow, even at the "Chicago fire," if only *the heat is right.* Hot enough, not too hot, and evenly heated clear through. "How hot?" About the hardening heat, never a high yellow or white heat.

"How to reach the desired end?" Keep the pieces to be heated where they can be seen, or come as near to that as possible, and when upon judgment, grounded upon experience and close observation, the heat is right, let the steel begin to cool down gradually; don't give it any shock by putting into cold ashes, charcoal, lime or other material; leave it in furnace to all cool down together by shutting off blast or draught if you please. Anybody object? But a wholesale method is required. Thousands of pieces are to be annealed—tons, and one of our Connecticut mechanics, Mr. C. K. Jones, with Russell & Erwin Mfg. Co., New Britain, Conn., believes himself, and it is believed by many others, that his patented invention for annealing, in which steel is placed in practically air-tight wrought-iron cases, *with no fine charcoal nor other material,* simply steel and the unavoidable spaces, and the air forced out and displaced by gas, the pressure kept on during the heating and cooling processes until below the oxidizing point, the heating to be done in a furnace, fully meets the requirement. No oxidation takes place, not even sufficient to discolor bright finished work, and of condition for working is said "*perfect,*" while ultimate value of tools made from steel so annealed seems to be all of which the steel is capable.

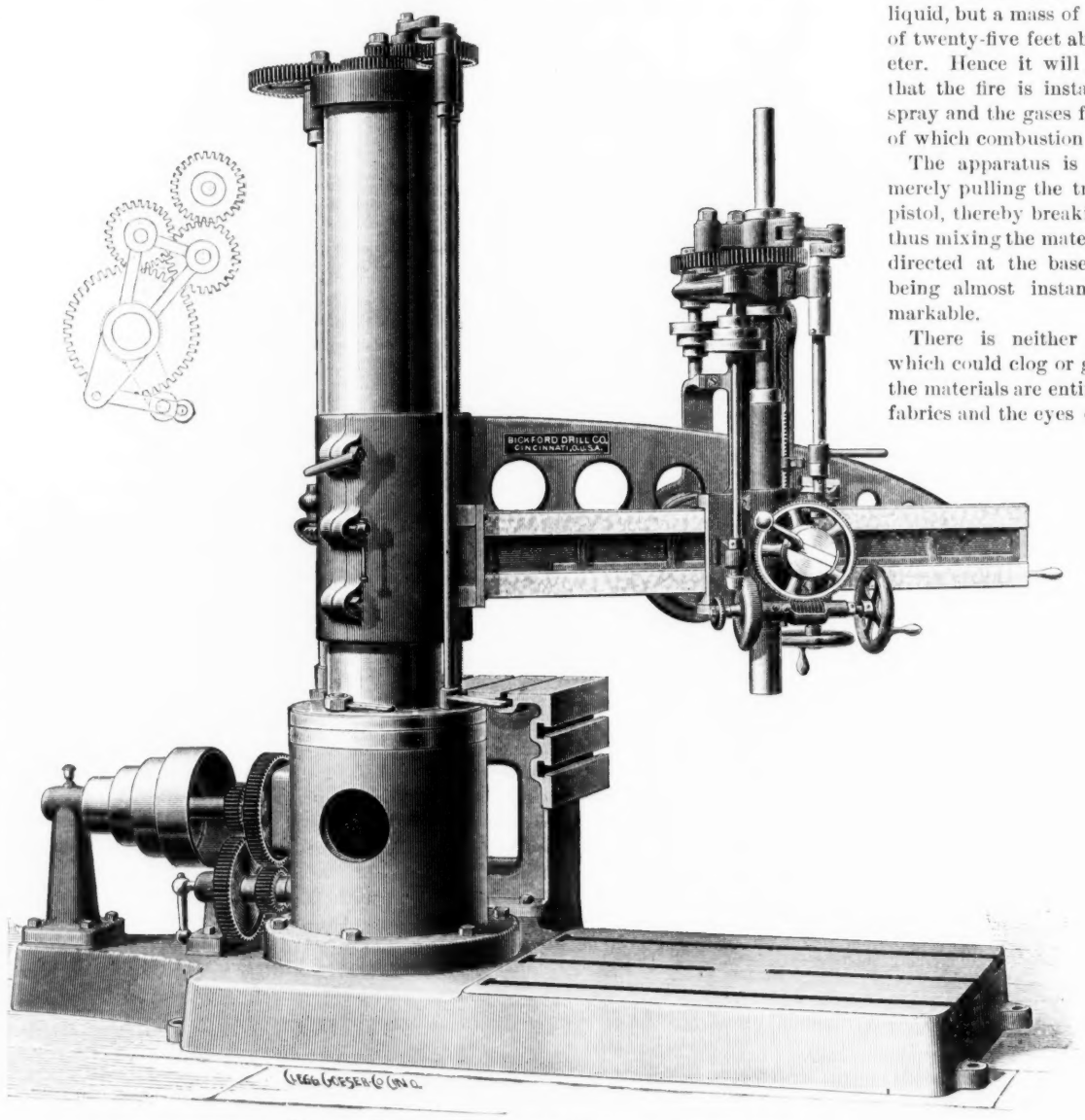
"Right heat needed as by other methods?" Yes, but with the spaces filled with a first-rate conductor, instead of fine charcoal, with a furnace as controllable as that of Brown & Sharpe's, this method of Mr. Jones comes the nearest to heating each piece in plain sight of any wholesale way I have ever seen.

The somewhat remarkable fact has been commented upon that when Gen. Thomas T. Eckert, who succeeds the late Dr. Norvin Green as president of the Western Union Telegraph Company, was an operator, he led one of the largest and strongest strikes which the Western Union ever had to fight. General Eckert won his military title in charge of telegraphic work for the Union army during the civil war.

Radial Drill Press with Tapping Attachment.

The accompanying illustration is of a radial drill press, built by the Bickford Drill and Tool Co., of Cincinnati, O., and which has an attachment by which heavy tapping can be done with the drill spindle, which is automatically reversed at the proper point to run the tap back.

This reversal is accomplished by means of the arrangement of gears, a diagram of which is shown with the engraving. A clamp, which is adjustable on the spindle rack, comes into contact with the reversing lever as the spindle descends, and by moving this lever releases it from a notch, the strain on the gears being such that, as soon as this is done, they of themselves release, and by the action of a spring go into position for the reverse motion. When the tap has been run out the operator restores the lever to its normal position and starts the tap in again. The machines are being used for 6" pipe taps, and are working satisfactorily on such work, all the parts being made sufficiently heavy and strong to stand the strain of such work easily.



Radial Drill Press with Tapping Attachment.

The attachment in no way interferes with the use of the machine for drilling and boring, and it is supplied with several different sizes of machines.

A New Fire Extinguisher.

Mr. Gus C. Henning, M. E., of this city, has acquired an interest in the business of the Jersey Lightning Extinguisher Co., whose works are at No. 524 Henderson street, Jersey City, N. J., where a public test of the new extinguisher was made on March 14.

A structure was built of pine boards to represent a corner of a room, ten feet long each way, and eight feet high. In this corner, and eight feet each way from it, were placed split tarred staves and pine kindling, and a mass of shavings, so as to form a heap of most inflammable material, and the walls were saturated with petroleum and set afire. When the pine walls had taken fire, so as to become charred, the stream of one of the extinguishers was directed at the fire, and in less than fifteen seconds it was extinguished completely.

The mass was then once more saturated with petroleum, and after the flames reached a height of twenty feet, a single extinguisher again put out the fire so as to leave not a spark.

The apparatus consists of a strong glass bottle, the top of which is sealed by a tin cap, which carries an acid bulb on the inside, and a protected trigger outside; in it is a small squirt tube plugged with a cork. When the acid in the bulb mixes with the material in the large bottle, which is carbonate of ammonia, gas under heavy pressure is formed which drives out the cork, and throws a stream of a mixture of carbonate of ammonia, chloride of ammonia, and carbonic acid gas to a distance of twenty-five feet and over, until the materials are used up.

The stream thrown out is not a compact liquid, but a mass of spray, and at a distance of twenty-five feet about two feet in diameter. Hence it will be readily understood that the fire is instantly suffocated by the spray and the gases formed, in the presence of which combustion becomes impossible.

The apparatus is put into operation by merely pulling the trigger, as in any gun or pistol, thereby breaking the acid bulb, and thus mixing the materials, and the stream is directed at the base of the fire, the effect being almost instantaneous and truly remarkable.

There is neither valve nor mechanism which could clog or get out of order, and as the materials are entirely harmless to woven fabrics and the eyes or the skin, no injury is possible.

All bottles are tested by hydraulic pressure by a pressure 33⅓ per cent. greater than that which can be generated by the materials with which they are charged, hence they are safe against bursting. The whole affair is simple, weighs about five pounds, and is intended to be placed about a building or shop in such numbers as to be always at hand when a fire breaks out. One trouble with the glass bombs, which have been extensively used for this, is that by a misdirected throw, which is liable to occur in times of excitement, the effect is lost, or when thrown agianst a soft or yielding object, such as a curtain, they may not be broken.

A New Sewing Machine Device.

The prevalent idea is that when a sewing machine is once threaded up it is an object to keep it threaded as long as possible, but Mr. F. H. Treacy, who, as our readers know, occasionally favors us with a contribution, has for some time, and is now assisting in the development of a device which removes the thread from the eye of a sewing machine needle and replaces it at every stitch. At the very high speeds sometimes attained in manufacturing operations, there is more or less trouble, from the fact that any given portion of the upper thread must pass a number of times back and forth through the eye of the needle at great speed, the heat sometimes thus generated being sufficient to blue the needle. It is impossible also to use any but the best of thread, because the least imperfection in it causes it to be literally worn out and broken by passing

through the eye. The eye of the needle used with the new device has an opening at the back through which the thread can be passed into it. The device holds a section of the thread horizontally back of the needle and under moderate tension. Just before the needle enters the cloth this thread advances so that it bears against the needle below the opening to the eye, which it enters as it comes down, and is carried through the cloth in the usual manner, to be withdrawn again as it comes up. With this device 1,500 stitches per minute have been taken, using thread of a quality which could be used in no other way, and it is possible to even tie knots in it without detriment. The device is quite simple and inexpensive, and it is not impossible that some important modifications of sewing machine construction may result from it.

Columbian Exposition Notes.

HARD RUBBER PUMPS AND PIPING.

In the Fisheries Building the United States Government will have a rare display of fish and fish merchandise. The building is a beautiful one. It consists of a main rectangular portion surmounted at its middle with a graceful tower and flanked at each end by a circular pavilion, connected to the main building by a colonnade. The building is decorated in staff, and the ornamentation is particularly appropriate to the nature of the display in the building. The main building is 360 feet by 160 feet and the wings are each 130 feet diameter.

One of the wings will contain the angling display, while the other will hold the aquaria in which will be kept the live fish. In the center of this pavilion is a circular fountain and around it are two sets of glass aquaria, polygonal in form and concentric with it, of 70 feet and 120 feet diameter, respectively.

The greater part of these aquaria will be devoted to salt-water fish, and for circulating the salt-water there is a very interesting pumping plant. The salt-water will have to be brought from the Atlantic; consequently it must be used as long as possible before renewing.

The water will go through the following process: It will be drawn from a large storage tank by the pumps and forced into a distributing tank in the attic. The pumps are located in the basement of the main building. From the distributing tank it will lead down and pass through a steam temperature regulator to the aquaria. At the aquaria it runs through smaller pipes over each aquarium. These pipes are perforated with small holes through which the water sprinkles. From the aquaria it is drained back to the reservoir; it is purified in this last step by passing through suitable filters and aerating tanks.

In order that the water may remain as pure as possible it will only be allowed to come in contact with surfaces with which it will have no chemical action. The pumps and most of the piping are of vulcanite rubber. The aquaria are of glass and cement.

There are two pumps, 4x10-inch stroke, each driven independently, by an electric motor, through a countershaft, which belts to a shaft on the pump having a tight and a loose pulley, and a pinion. This pinion drives a crank-shaft connected to the piston. The cylinder, valves, air chamber, suction and delivery pipes are all of hard rubber. The piston rod is of steel coated with vulcanite, while the piston is made up of two leather flanges with rubber packing. The suction pipe is 3 inches and the delivery 2½ inches. The pumps make 90 strokes a minute.

All valves, tees, crosses and flanges are of hard rubber also. All connections are screwed, except occasional flanges for convenience in disconnecting.

The pipes in the temperature regulator are of brass, tin lined, and the valves controlling the heater are of the same material.

The following sizes of hard rubber pipe are used—3, 2½, 2, 1½ and ¾ inches. The pumps and piping were built to stand 70 pounds per square inch hydraulic test pressure, and 40 pounds working pressure.

The pumps and all rubber piping were furnished by the India Rubber Comb Company, of New York City.

LETTERS FROM PRACTICAL MEN.

Filing Technical Articles.

Editor American Machinist:

Answering the query of O. A. Smith in the AMERICAN MACHINIST of February 16, the best way I know for filing or indexing the many interesting articles constantly appearing in the various scientific periodicals, that the busy mechanic or engineer may quickly find any item which may previously have interested him, is the card

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index system, used by many large libraries and also by professional men, as ministers, and by others. It is very simple and capable of indefinite expansion of the widest range of topics. Have a supply of cards of convenient size, say, 2x3 inches, a number of them can be kept in an envelope in the pocket, ready for instant use, and can afterwards be filed at leisure. Enter on the card, under some distinctive heading, the subject of the article, with the name of the periodical or book, page, date, author, etc.

For filing, one large drawer divided into 26 compartments, each large enough to hold a large pack of the cards standing up edgewise, will suffice for a long time. The advantage of the system is that it applies not only to all the books, magazines, and periodicals preserved by the one who makes the index, but also to any other articles he may read in libraries or casual places. Items appearing in such evanescent things as daily papers can be cut out and put in numbered envelopes or pigeon holes, and the cards can refer to the proper receptacles. Trade catalogues and circulars or price lists can be treated in the same way. In large libraries, all books, and each separate topic or article in the magazines received, are indexed on two sets of such cards, one referring to subjects, and the other to authors, and both referring to the proper book and shelf number.

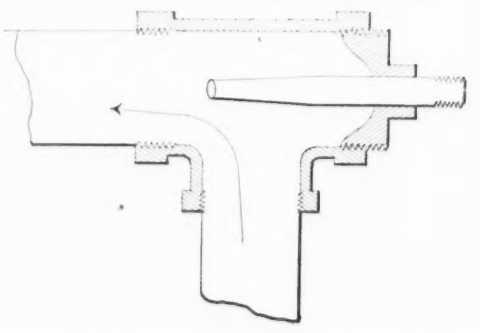
As examples of such index cards the samples well illustrate the idea.

WM. MERRILL.

Heating Shops by Exhaust.

Editor American Machinist:

Both Mr. Wilson and Mr. Heald propose crude and expensive ways of doing a very simple and inexpensive thing, in either throwing off belt and running engine light to get steam into the heating pipes, or in putting



the engine on its center and blowing through excessively large drip valves. It is just as easy to get drip valves too large as too small; they should be only just right for the purpose for which they were intended. If an engine running with belt thrown off uses steam enough to heat the shop, it must either be wasteful or else furnish too much steam when loaded.

To put an engine on its center and let steam into the chest exposes the valve and piston to severe cutting action from the steam blowing past them, and under the most common conditions this will most surely be the case.

How much simpler and better to arrange a by-pass from steam to exhaust pipes and avoid all the trouble of the two other ways. As in most all other things there is a right and wrong way to put in a blow-by or by-pass pipe connection. The sketch shows the correct way. When so arranged the velocity of the steam as well as its pressure assists in keeping up the circulation, and should it be necessary or desirable to help out the exhaust when the engine is running, it will not add to the back pressure, as the reduced jet acts like an ejector. The whole matter is simply to put a T in the place of some elbow

BROWN & SHARPE MFG. CO.
Catalogue and Prices
Pigeonhole No. 13.

in the exhaust pipe and introduce the live steam into the run, letting the inside tube project a little beyond the center of the side opening of the T. Make the jet about two pipe sizes smaller than the live steam supply.

I know of a plant so arranged where the exhaust pipe is 6″, the live steam 2″, and the jet 1¼, and they have no trouble in heating twelve rooms, 100x50, and some of them 400 feet away from the engine room.

PETER H. BULLOCK.

A Machinist in the Navy.

Editor American Machinist:

Being informed that you want—for publication—a statement as to the status of a machinist in the navy from one of that number, I beg to submit the following:

The position of a machinist is as anomalous as his title is misleading. We are obliged to be by trade machinists, in addition to which we must have had experience in operating marine engines. On the smaller ships we take an engine room watch, exactly the same as an assistant engineer in the merchant service, but we are not eligible to promotion. We are enlisted for a period of three years; we are obliged to sleep in hammocks, which are stowed away early in the day, and we have no place to sit down nor lie down when coming off watch in daytime, excepting on the bare berth deck, sometimes wet, but frequently well filled with the crew, black and white. We "mess" with the other first-class petty officers, in the same apartment with the landsmen, coal-heavers, etc. The petty officers on deck are "rated" from the crew by the commander, and these frequent ratings and disratings and re-ratings are evidence of the comparatively irresponsible character of their duties, and that they are not and cannot be the peers of mechanics, whose trades require four years of apprenticeship and instruction. We not only perform work requiring skill, but we are charged with considerable responsibility.

Our privileges, however, are not commensurate with our responsibilities. We get "liberty," like the crew, at times, and are subjected to the same restrictions. At the pleasure of the executive officer we may be paid "monthly money" or "liberty money" in limited sums, and though modern custom permits us to sign the receipt, yet it must be witnessed by an officer.

The principal embarrassment we feel now is in being obliged to mess and to sleep in the same apartments with the men we are to control on watch. The old regulations of the navy recognized this necessity in separating the commanding officer from the ward room, the ward room from the steerage, the steerage from the warrant officers, and the warrant officers from the crew. There can be no question that our trade and our responsibilities are at least equal to those of a carpenter, a gunner, a sail maker, or a boatswain.

There being neither prospect of promotion nor of increase of pay, there is no inducement for a good machinist to continue in the navy. Unless he is unfortunate, in one way or another, a machinist will never reenlist; the better ones leave after one cruise, the others remain. Of those who continue, some are unhappy in domestic affairs, some seek the iron rules of the navy as a protection against intemperance, some—and they do get in—are unable to do as well elsewhere. It seems to us that the government should procure and retain the best men the country affords; it surely gets good ships and good machinery. Now why not consider the necessities of the service, and make the position of a machinist so attractive that the better class will continue, and be contented? Surely it will not be safe in time of war to trust to inferior skill. VERITAS.

Standard Catalogues.

Editor American Machinist:

In your issue of March 2, 1893, we note the interesting editorial on "Standard Catalogues." If all manufacturers were to adopt 6x9 as a standard size for their catalogues, each would certainly reap great advantages in the way of facility in filing, binding and quickness of reference, which would many times more than repay for the trouble in the initiative conformance to the standard.

We did not know that the American Society of Mechanical Engineers had adopted 6x9 as their standard, and think if it were generally known the movement would acquire a very appreciable impetus.

This company has always made their catalogues 4x6, considering this a convenient size for pocket use, and a size that readily fits into the ordinary pigeonhole of a desk, and if it were adopted as the standard we would find no objection to it; but we can readily see that a larger size for a standard would be preferred by many, and probably would suit us about as well, and as the tendency is in the direction of 6x9 we shall make our next catalogue that size.

This move, however, to be entirely and comparatively quickly successful, should have a guiding hand, a headquarters, by which all the manufacturers of the country would have the matter presented to them in a convincing light, with system and perseverance, resulting probably, after a little thinking on their part, in their joining the ranks of those adopting the standard.

After reading the foregoing remarks it will occur to the mind of the reader that the one pre-eminently fitted place at which to establish such headquarters is in the office of the AMERICAN MACHINIST. We have passed the hint; what does the AMERICAN MACHINIST say? If it should publish from week to week a list of those declaring in favor of the 6x9 standard we prophesy the list would soon become a long one.

F. E. REED & CO.

[We have for some years advocated a standard size for catalogues, and shall be willing to do anything we can to help the work along.—ED.]

Pipes and Pipe Joints for Pumps.

Editor American Machinist:

Referring to Mr. Crane's query in your issue of February 16th, as to the use of bell-joint pipes for a pump supply, permit me to say that when the water must be lifted the use of such a joint is certainly open to objection. It can be cheaply and quickly laid, and, being made of cast-iron, the pipes are little likely to rust under ordinary conditions, and that is about all that can be said in their favor.

A difficulty met with here some four years ago in the use of a 12-inch bell-joint pipe for the supply of a pump, which delivered water at 350 pounds pressure, arose from the slow and imperfect closing of the pump delivery valves, which sent a heavy shock back into the supply pipe. This knocked out completely one joint, which was somewhat imperfectly made, and loosened some

others. This supply pipe had at the pump a head of water in it of about 16 feet when the supply tank was just empty, and ranging up to 30 feet when the tank was full, so that no doubt ever existed as to the presence of solid water at the pump in question.

Mr. Crane's comment upon the use of wrought-iron pipe with screwed ends for pump supply is a timely one, and it may be worth noting that welded wrought-iron or steel pipe may be so coated by the well-known "rustless" process as to be made practically secure against any ordinary tendency to corrosion. A much better way to connect wrought-iron or steel pipes for all purposes and for all the pressures where ordinary "O. D." or "boiler tube thickness" will suffice, is to abandon the use of threads entirely, and to expand the pipe into a heavy cast-iron or steel flange by hammering it outwardly with a round-faced hammer, so that the pipe is secured solid in the flange. The length through the flange is usually made about one-third the diameter of the pipe, and the flange is bored so as to drive on tight at the back end, and is tapered in boring about $\frac{1}{16}$ inch in its length, so that when the expanding is completed the pipe can be pulled out of the flange only by overcoming the static friction due to the expanding it, but also by crushing in the slightly tapered end. For still greater security some men prefer to recess the face of the flange, and to round over the extreme end of the pipe into this recess. Pipes may be set in their flanges in this way from say 4½ inches up to 16 inches, but for smaller sizes the roller tube expander should be used, and sizes larger than 16 inches should probably always be put on with rivets, in the usual boiler making way.

It cannot be said that this note covers any new ground, but the methods referred to are not so widely known as they should be.

Pittsburgh, Pa. P. Barnes.

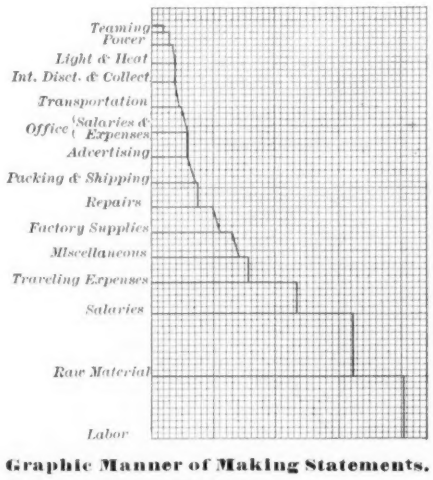
That Emery Wheel Once More.

Editor American Machinist:

Is it too late to speak once more on that emery wheel? If not, "I rise to offer a few remarks." In running a common emery wheel, a disk wheel, I mean, the fear of bursting it always deters me from running it as fast as I would like to. I would like to run a wheel at 8,000 feet instead of 5,500, and many wheels will stand that, or even a higher speed, and they cut faster, keep their shape better, will not get out of round, and will last very much longer, than wheels run at a much lower speed. But the trouble is one cannot tell that the particular wheel he is running is safe to run at a speed above the maker's rating, and there is no way of reinforcing it. If one glues a leatherboard washer to each side of the wheel of about half its diameter, and uses well-fitted collars of about one-third its diameter, it is about the best, and all, he can do. He cannot band such a wheel, for it would interfere with the use of it. With the cup wheel it is entirely different. It is, it is true, as usually made, inherently weak, but it is capable of being made indefinitely strong, for there is room to put bands on the periphery of the wheel sufficiently strong to stand almost any speed, certainly any desirable speed. Of course, it would not be practicable to drive bands directly onto the base wheel, but I propose as follows:

Make a ring of 2 inches, more or less, in width, and of such diameter that when turned on the inside it will slip tightly on the wheel, and turn off the outside with a taper of, say, ¼ inch to the foot. This ring will do to be cast-iron. It may be made in the same way as a packing ring for a piston, that is, hold a suitable casting in a chuck, turn it inside and outside, and then cut it off, and it wants to be cut through, same as a packing ring. Now make a strong wrought-iron or steel band, turn it on the inside to the right size and taper to fit the other band and also turn it on the outsides and edges. Now put one or two layers of thin paper around the emery wheel, slip on the first ring, and drive the other on over it. If it drives on not far enough or too far, take out part of the paper, or put more in, as the case may be. The ends of the cut band should nearly meet, so as not to throw the wheel out of balance, and both bands should be placed so as to run truly. The outer band, if sufficiently strong, may be driven tightly enough to make it safe to drive a wheel at any speed desirable, and when the face has worn away up to the edge of the band, it will be only the work of a few minutes to move them back a little and tighten them up again. When one wheel is worn out the bands can be used for another wheel of the same size. The above is my plan to keep a cup wheel together, and I think it much preferable to having a box around the wheel to catch the pieces when it breaks.

T. Hodgson.



Graphic Manner of Making Statements.

Editor American Machinist:

Here's to that section paper again. I think the inclosed graphic mode of making a statement of one's business is novel to many of your readers. By using any multiple of 10 to the square inch a correct proportion of the various items to the total cost can be easily obtained, and laid out in this way conveys a more accurate impression than the array of figures would. The same section paper can be used to show in the same way any other class of facts when comparison is the object.

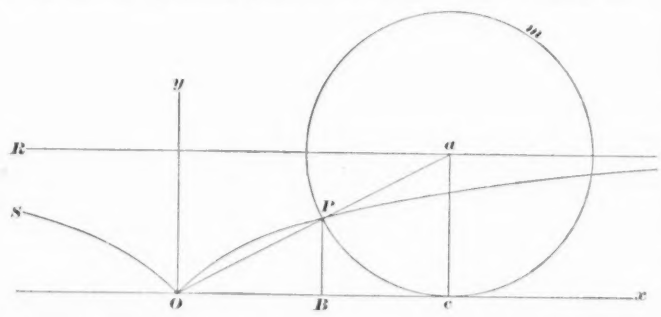
J. D. Cox, Jr.,
Manager of Cleveland Twist Drill Co.

Equation to Curve.

Editor American Machinist:

A very simple method for finding the equation of the curve given by Mr. Allen, in your issue of February 9, is as follows:

Let $P\ C\ M$ be any position of the circle, and p the corresponding point in the curve.



Draw $P\ B$ and $A\ C$ perpendicular to $O\ X$, then will $P\ B =$ the y ordinate of the point, and $A\ C$ the radius of the circle.

Now $P\ O : P\ B : : O\ A : A\ C$ or $P\ O : y : : P\ O + R : R$; but $P\ O^2 = x^2 + y^2$ $(O\ B^2 + P\ B^2)$ or $P\ O = \sqrt{x^2 + y^2}$; therefore $\sqrt{x^2 + y^2} : y : : \sqrt{x^2 + y^2} + R : R$; $y\sqrt{x^2 + y^2} + Ry = R\sqrt{x^2 + y^2}$, which is the required equation.

It is evident that there will be two branches of the curve both starting at the origin, and running out in opposite directions. Also the curve in both its branches will constantly approach the line of centers $R\ A$, for as the circle goes farther from the origin the line joining its center with the origin will get nearer to being parallel with $R\ A$, and will intersect the circumference closer to the same, and at infinity will meet it. Hence it follows that the line $R\ A$ is an asymptote to both branches, an asymptote being a tangent at infinity. As to there being any center to the curve, I think it hardly possible, at least in the same sense as the term is used in the conic sections. The equations for the normal, sub-normal, etc., are easily arrived at from the equation of the curve by formulas given in the text-book.

A Stevens' Tech.

The Amoskeag Fly-wheel—Feeding Boilers.

Editor American Machinist:

In looking over the last volume of the "Transactions of the American Society of Mechanical Engineers," I note a paper by Mr. Manning, superintendent of the Amoskeag mills, entitled "A Novel Fly-wheel."

This is quite an interesting paper, as there are many valuable suggestions in it, but there is one that looks a little strange, and will bear discussion.

It was thought that there was one lesson that the broken wheel [Amoskeag mills at Manchester, N. H.] had taught engine builders and others interested, and that was that these wide-rimmed band-wheels would be stronger and safer with two wheel centers and two sets of arms.

Mr. Manning brings up another point, and that is, irregular speed. It seems that the looms in this mill were arranged to "knock off" automatically when the speed became too high; that this engine was designed to run 61 revolutions per minute, but it is admitted that at the time of the break that it must have been 73, and how often it had been at that or above there is no record.

If a boiler was built to run with 60 pounds steam, and the pressure was carried up to 75 or 100 occasionally, we would not be surprised if it let go some time at 50 pounds.

Mr. Dickie raised the question of the cause of this excessive variation of speed. To this Mr. Manning replied that, "if Mr. Dickie had had any experience with Corliss engines he must know that when the governor was set for a heavy load it would overrun at a light load." This is an unusual idea of the functions of a governor on a Corliss engine, as the whole change of speed during the range of the governor's action should not vary over four or five revolutions, and if the lowest speed was 61, the highest should not be over 65 or 66, even if all the load were thrown off the engine.

I am speaking from a number of years' experience in rolling-mills with Corliss condensing engines, where the load changes instantly from an overload to nothing but the friction of the engine and rolls, and I have never known of a case of any of the engines overrunning when the governor and valves were working smoothly. I have seen one case where an inferior cylinder oil was used, and the engine working under a full head of steam from the throttle and no load on for a long time, say half an hour or more, that when the valve was tripped the friction of the valves was so great that they would not entirely close until the return motion of the wrist-plate. In this case, the collar on the governor staff was set too low, and did not allow the governor to raise sufficiently high so as not to open the valves at all, as governors on this class of engines should do, and if the valves do not open the engine cannot run too fast.

It would be interesting to know if there are other cases where governors are "set" so they will not control the valves with a light load, as it may account for some other "busted wheels."

We are now putting in a mill to be driven by a compound under the conditions that obtain in the other rolling-mills, and in this case am a little anxious to see what a thorough trial will show in the way of racing, as this is a cross compound with a good sized receiver.

Engines sometimes run away from breaking of the governor belt, and in many cases it is not surprising that the belt breaks, for we often see them strained up tight enough to run a circular saw.

As these belts are run in a place where they get a good dose of latter day oil that is not conducive to their longevity when the unnecessary strain is put upon them, they give out. These belts, as put on by most builders, are many times too large for the service required, so the margin of safety is all right, and it is the writer's custom to run them loose, and in a few years consider them worn out, and get new ones. By this course they become absolutely safe, unless something should fall on them.

Recently there appeared a description of a Peck-Wheeler arrangement for heating feed by live steam, and editorial comments questioning the feasibility of gaining anything by heating feed water with live steam. Of course, no heat units can be added, but the economy comes in from the improved circulation in the boiler.

The greatest economy would be in the boiler having the poorest circulation. It is not necessary to go into a general explanation of the circulation in a boiler, and where there is a lack of it there are overheated plates with high flue gases, etc. The most economical device for feeding boilers is a power pump, with the temperature of the feed entering the boiler being the same in all cases.

If we have a power pump feeding a boiler with water at 60°, and put on an injector receiving water at 60°, and heating the water to 212° or higher, notwithstanding the fact that there must be a loss from radiation, both from the steam and water pipes, there will be a saving in fuel by the use of the injector, and the injector using the most steam, and heating the water the hottest will be the more economical.

A Connecticut master mechanic of a railroad, some years ago, changed the feed from the barrel to the water leg of a locomotive, and it would not steam until the feed was put back into the barrel again. This was when pumps and cold water were used.

If he had been feeding with an injector it would not have made so much difference, as it would not interfere so much with the circulation.

W. E. Crane.

Split Chucks for Holding Drill Wire.

Editor American Machinist:

Every tool maker and good machinist knows the difficulty of holding wire (round Bessemer or cast-steel drill wire from say ¼" down to No. 60 Stubs gauge) true. I mean true in the strictest sense of the term; he also knows the desirability of the same. Steel drill wire is one of the most popular and valuable aids to the tool maker imaginable. The accuracy with which it is made, the quality of stock, and the variety of sizes make it simply invaluable to the modern mechanic.

Allow me to state that, in my opinion, the said Stubs gauge, as regards the method of numbering (wrong end to,) and particularly the lack of uniformity between the sizes, makes it attain to the eminence of *monumental mechanical jackassity;* and the worst of it is the same gauge is adopted for twist drills by the different makers. Why in the name of horse sense doesn't some manufacturer of the drills and wire rods adopt the metric system for drill wire, and wire of every description with $\frac{1}{10}$ mm. between the sizes, and then in this No. 1 would mean $\frac{1}{10}$ mm. or the next size to nothing, and so on up, to say nothing of the immense advantage of having one exact and known relation between the sizes?

There is but one way that I have discovered up to date of holding wire true; there is and never will be but one chucking appliance for holding work true in the lathe, that is, the split chuck; and it may be taken as a mechanical axiom that any appliance that will hold more than one size of work will hold nothing true, and if owners and foremen of tool rooms only knew of the immense advantage with which a set of *properly made* split wire chucks from 1 to 60 which can be used in any speed lathe (and any hollow spindle lathe speeded high enough for such work) by having a suitable socket to fit taper in spindle and piece of gas pipe with small hand-wheel on one end, and a steel pull piece on the other for draw in

spindle, more of them would be used. If once a man gets used to such an arrangement as this, the constant use he can put it to, and the very great increase in the quality and quantity of his work, will cause him to wonder how on earth he managed to get along without the split chuck as long as he has. H. HARDINGE.

Chicago, Ill.

Drawings and Drawing Paper.

Editor American Machinist:

I am glad to see Mr. Norris' ideas as to "Section Paper and Its Correct Use," and hope others will give their ideas on this matter, as it is worth a good deal of comment. My idea as to its use was to have it cut from a paper of a quality to take ink sketches freely, and to also admit of taking prints from, and only to use it in 12″x18″ sizes made into pads, and to only be called into service where a cheap or hurry job was wanted which could easily be made on this paper, which was to have been ruled in pink, and, as Mr. Norris suggests, thus being able to make a correct free-hand sketch from which a print could be made, thus being able to keep a correct copy for reference instead of filing old greasy sketches for future jobs of a similar nature. This also gets rid of the annoyance of the loss altogether of the sketch, which we all know will happen, no matter how careful we try to be. Not being able as yet to get any one to rule this paper for me, and put into pads at a reasonable figure, I am without the satisfaction of its use. It would answer admirably on a great deal of my work. After we have this ruling let's also put on figures, as $\frac{1}{64}$ and $\frac{1}{32}$ sizes will yet be hard to read, and a drawing, especially a blueprint without figures has no place in a shop—it will only do to represent our ideas and not do work from, especially when shade lines are used.

Mr. Norris' remarks on the old-fashioned way of making a cheap papered drawing and tracing on cloth giving way to quicker methods, leads me to give your readers my experience with this very unsatisfactory method. We all know how badly our tracing paper or cloth will match over on penciled lines in damp weather, caused by unequal shrinkage of the two papers, thus causing much loss of time, together with much vexation and a poor and unsatisfactory tracing, at the expense of the paper and a high-priced tracing cloth. All this induced me to use "medium parchment drawing paper," sold by Messrs. Keuffel & Esser, New York, in 20-yard rolls. This paper I have found to give excellent results in every way, as you can (by putting a piece of thick paper under it) make your penciled drawing on it, and rub out and alter to your satisfaction; then ink directly over these lines, thus securing a tracing accurate to the original drawing, and after all, you can procure an excellent print from it by a little longer exposure. The paper is very strong, has a smooth and hard surface, takes ink splendidly, prints nicely, and is half the price of cloth, and you have no paper to use in addition to it for the first drawing.

But we cannot dispense with the tee square in this case as with the section paper, and I cannot see that Mr. Norris can either, as we all know that such paper, whether in sheets or not, will curl, and unless in pads I fail to see how he can do his drawing with any satisfaction, although to be able to turn the paper to suit the arm is a great help.

I would also like to procure the Chinese writing stick for trial, as have never used it, and if Mr. Norris will tell us where the best can be procured we will try it, as the idea is a good one.

I wish a word also as to drawing paper sizes, and have seen several articles in the AMERICAN MACHINIST giving a great many odd inch sizes. Now what's the matter with buying paper in commercial rolls of 36″ width, and then we can get 24″x36″ for largest sheet, then halve this, getting 18x24, halving again gives 12x18? Now if these are not easy sizes obtained, and good sizes for all uses, let us know why. C. G. SAULS.

Standard Sizes for Catalogues.

Editor American Machinist:

I find the most convenient way of filing catalogues of all sizes and shapes, except bound books and catalogues larger than 10¼x12¼ inches, is to use a BB letter file transfer case, which is a stiff pasteboard box, 10¼x12¼x3 inches, with muslin hinges. It is sold by Brown Brothers, 293 Broadway, New York, for 25 cents each. Two of the so-called standard size catalogues, 6x9 inches, fit nicely in this box, with 1¼ inches clearance at the end. If 6x9 inches is to be adopted as the standard, these four regular sizes may be used as follows:

Double standard, 9x12 inches; standard, 6x9 inches; half standard, 4½x6 inches; one-third standard, 3x6 inches.

For filing in the BB box, these may be increased to 10x12, 6x10, 5x6, and 3⅛x6 inches. The one-third standard is the proper size for mailing in ordinary letter envelopes.

WM. KENT.

Equation to Curve.

Editor American Machinist:

The equation to the curve proposed by Mr. Leicester Allen may be thus obtained:

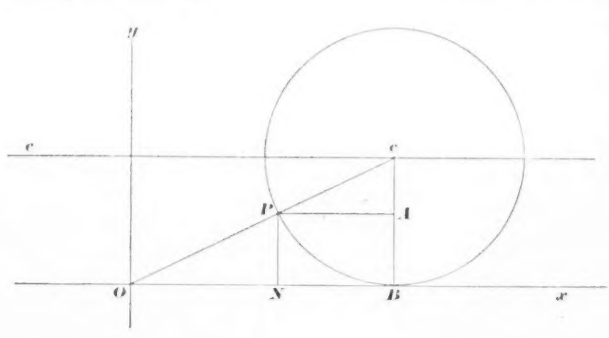
$$\frac{P\,N}{O\,P} = \frac{P\,C}{A\,C} \text{ i. e., } \frac{y}{\sqrt{x^2+y^2}} = \frac{r-y}{r} \qquad (1)$$

which may also be written

$$r \sin. \Theta = r - y \qquad (2)$$

or r covers $\Theta = y$

which is the briefest in form, but not the most convenient for investigation. The polar equation may also be written down directly from the figure.



If ρ = radius vector

$$(\rho + r) \sin. \Theta = r \qquad (3)$$

Rationalizing Equation (1)

$$y^2 (x^2 + y^2) - 2\, r\, y\, (x^2 + y^2) + x^2\, r^2 \qquad (4)$$

Which is in the form:

$$u_4 + u_3 + u_2 + u_1 + u_0 = 0 \qquad (5)$$

The chief characteristics of the curve are sufficiently obvious from the mode of construction, or might be readily deduced from Equations (5) and (4).

Since $u_0 = o$, the curve passes through the origin, as we see it does.

Since only the second power of x is involved, the curve extends symmetrically right and left of the axis of x.

u_1 being also $= o$, the form of u_2 indicates a double point at the origin which is seen to be a cusp.

From $u_4 = o$, we see that there is a real asymptote parallel to x which is evidently the line $C\,C$, as may be confirmed by putting $x = \pm \infty$ in (4) (first dividing by x^2), which then reduces to

$$(y - r)^2 = o.$$

The equations to the tangent, normal, etc., may be found in the usual way. A simple mechanical means of constructing the curve is to pivot a rod at o and slide a tube along it, with one extremity on $C\,C$, while the other extremity traces the point. The problem might then be generalized thus: Given the distance between the points on the slide, and the co-ordinates of the pivot, what curve will one point trace when the other follows a given line, straight or curved? G. R.

Screw-cutting.

Editor American Machinist:

I have had several temptations to make a few remarks to the readers of the AMERICAN MACHINIST on screw-cutting during the last two years, and have at last concluded to do so. There is a very simple way of figuring gears for cutting threads that I have not seen mentioned in the AMERICAN MACHINIST, and one that I have found to be very convenient. Most lathe builders make the teeth of the change gears increase in number by arithmetical progression, and I think it is a good way, as it makes it easy to figure threads that do not happen to be on the index plate. The numbers most used as a common difference are 5, 6 and 7. Now take any lathe whose change gears increase in number of teeth by a common difference, and it is only necessary to multiply the number of threads in the lead screw in a certain distance, and the number of threads in the screw you wish to cut in the *same* distance, each by the common difference of the teeth of the change gears, and it will give the correct gears for that thread. For instance, we wish to cut 11 threads per inch and the lead-screw has 4 threads per inch, and the common difference of the gears is 7 teeth. In one inch of the lead-screw there are 4 threads, and in one inch of the desired thread there are 11 threads; therefore $4 \times 7 = 28$, and $11 \times 7 = 77$, giving 28 and 77, which will cut 11 threads per inch.

Now suppose we wish to cut 4½ threads per inch; as 4½ will not multiply by 7 without a fraction, we will take two inches of each thread; 2″ of lead screw = 8 threads, and 2″ of desired thread = 9 threads; then proceed as before, $8 \times 7 = 56$, and $9 \times 7 = 63$, giving 56 and 63 as the correct gears for 4½ threads per inch.

Now suppose we have a 3½″ bolt to cut a U. S. standard thread on; U. S. S. for 3½″ diameter is 3¼ threads per inch, and in order to figure 3¼ threads per inch with the number seven as a basis for the change gears, it will be necessary to take 4″ of each thread, as 3¼ per inch and 4 per inch will not come together without a fraction in less than 4 inches.

Therefore, in 4″ of lead-screw there are 16 threads, and in 4″ of 3¼ threads per inch there are 13 threads, and $16 \times 7 = 112$, and $13 \times 7 = 91$, giving 112 and 91 to cut 3¼ threads per inch, and as the product of the lead-screw and the common difference gives the driver, the 112 gear will be the driver in this case.

This method will work just as well when the lead of the thread in inches, or parts of an inch, is given. For instance we wish to cut a worm of $\frac{9}{16}$ inch lead (or pitch); now $\frac{9}{16}$ of an inch to one turn of worm, and ¼ of an inch to one turn of lead-screw, will come together in 2¼ inches. In 2¼″ there are 4 threads of $\frac{9}{16}$″ lead and 9 threads of ¼″ lead. Therefore $9 \times 7 = 63$, and $4 \times 7 = 28$, the correct gears to cut $\frac{9}{16}$″ lead (or pitch) 63 being the driver.

This rule will in all cases give the smallest pair of gears that will cut the thread when the common difference of the gears is a prime number. In case it gives a pair of gears that are too small for convenience, double or triple the size of both gears.

I would like to remark that I think that either the number 7 or the number 5 is a poor number to use as a basis for change gears. 6 is a better number, but in my opinion 8 would be the best of all, as the above rule could be applied on all U. S. standard threads without any figuring to see where the two would come together. For instance we wish to cut 2⅝ threads per inch (U. S. S. for 5½″ bolt) in order to find the proper gears; $2\frac{5}{8} \times 8 = 19$, and $4 \times 8 = 32$ (with the same lead-screw as before), giving 32 and 19, which will cut 2⅝ threads per inch. Very few of the lathes now made will cut all the U. S. standard threads up to 6″ in diameter, and the 11½ pipe thread (which is as necessary to cut as any of them), while if 4 threads per inch were used as a lead-screw, and the number 8 as a basis for the gearing, all U. S. standard threads to 6″ diameter, and the 11½ pipe thread could be cut on a simple geared lathe, with a set of 16 gears, the smallest having 16 teeth, and the largest only 80 teeth, including two gears of 64 teeth.

I have been running a 21″ swing, 12-foot bed, lathe made by one of the best firms in the country (lathe cost about $1,200 three years ago), but that lathe would not cut five of the U. S. standard threads, nor the 11½ pipe thread.

There are 14 gears with the lathe running from 28 to 112 teeth, making a total of 966 teeth in the set, while the set above spoken of, containing 16 gears, would only have a total of 713 teeth. I do not believe the set of 16 gears would cost any more to make than the set of 14 gears, even if the four smaller gears of the first set were made of steel, while the convenience of being able to cut all U. S. standard threads and 11½ pipe thread would be greatly appreciated by machinists, and would also greatly encourage the use of standard threads. WRIGHT.

Micrometer for Cross-feed.

Editor American Machinist:

While Mr. Gribben's micrometer for cross-feed on lathes is quite an ingenious device, I think that there is too much of it for the every-day lathe hand to grasp, and a little too much work on it to have it adapted to the lathes now in use. What is required is something simple and inexpensive, so that the workmen of to-day can attach it to their lathes without asking the permission of the employer or foreman, as generally they do not care to give their workmen time to make new attachments.

Lathes of modern make have threading stops, and all that is required to make a good micrometer of them is to see how many times the thread on their screw will go into 1,000, and divide the shoulder of the screw into that many parts, which can be easily done on any lathe, by using the back gear or a gear on the spindle as an index plate. Of course, a line on the stop is required to give a point to work from. It is best to have a greater number of divisions on the shoulder of the screw than to have a number which will go into 1,000 and leave a remainder. THOS. W. R. MCCABE.

Getting Steam into Exhaust Pipe.

Editor American Machinist:

Replying to C. C. Heald, in the issue of March 2d, would say that the way that he proposes to get steam into the exhaust pipe of engine, for heating the shop, is not to be recommended, for several reasons. Neither is the way that Benj. F. Wilson speaks of, as both of them are first-class make-shifts. The proper way is to run a pipe from the boiler directly into the exhaust pipe, and use it when the engine is not running. The connection should be made in such a way that no steam will go towards the engine, but all of it be forced where it is needed.

W. H. WAKEMAN.

A New Rust Preventive.

We have received from Valmar & Goetze, 81 New street, this city, a knife, the blade of which has been partially covered with a new rust preventive called "Mannocitin"—a German invention. After thus covering parts of the knife blade with Mannocitin, it has evidently been immersed in water, until those parts unprotected are covered with a deep coating of rust, while those parts protected are as bright as ever. It is colorless, and it is claimed neither contains nor attracts acids, withstands all atmospheric influences and sea water, never turns rancid, never hardens, leaves no marks of any kind upon the metal, and is very economical to use. It may be applied with a brush, cotton waste or a soft rag, and is removed by a rag moistened with turpentine. It comes with some very strong recommendations from some of the best machinery establishments in Europe, and we judge it to be a valuable article for the purpose.

Preaching and Practice.

A convict says he was sent to prison for being dishonest, and yet he is compelled every day to die out pieces of pasteboard which are put between the inner and outer soles of the shoes made there and sold as solid leather.—*Shoe and Leather Reporter.*

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A New Way of Selling Machinery.

During a recent visit to Philadelphia we happened to witness a new method of selling machinery—at least such machinery as is sold to manufacturing establishments.

A wagon was driven up to the door, a young man alighted, and asked the privilege of giving a practical demonstration of the workings of a machine for pattern makers' use. Permission being granted, he, with the help of the driver, unloaded from the wagon and brought in a Fox trimmer, which he proceeded to operate in a skillful manner, showing how readily it, by a single movement of a lever, cut pine wood into any desired shape composed of intersecting straight lines.

He had little trouble in taking an order for a machine and went forth seeking another pattern shop in need of the latest improvements.

Though this system of selling or a similar one has long been used in selling sewing machines and some kinds of farming machinery, it is, we believe, new in such a line as this where the salesman cannot permanently locate, but must go from place to place, hiring his team and assistance on the ground.

Where a machine has to be belted or connected to a steam pipe in order to operate, the plan could manifestly not be so readily applied; but no one who has an opportunity to witness this young man's operations can doubt that it has its advantages.

A Distinction With a Difference.

Some time ago one of our contemporaries "slopped over" somewhat in its praise of a lecture delivered by Mr. Z. S. Holbrook on the labor problem, and which lecture, so far as we could judge from the published abstract, contained nothing new, but much that is erroneous. Among other things the lecturer said, "capital is denounced as a criminal acquisition; the successful merchant or manufacturer is the real criminal of to-day." There was more of the same sort, and it is a fact, as our contemporary *Industry* says, "that this is simply answered by saying that it is not true, and, so far from being true, is just the opposite of it in respect to the popular estimation in which honest wealth is held in this country. . . . . Peter Cooper was a rich manufacturer of our time, but he never suffered obloquy, and we think Mr. Holbrook will have trouble in finding any blameless rich man in this country that is not looked up to and respected by those with whom he comes in contact."

The fact is, as every one knows, that those who inveigh against wealth and the possessors of it, without regard to the circumstances of its acquisition or its use, are few in numbers and uninfluential. We all know of dozens of rich men who have made their money honestly, use it wisely, treat others fairly, and command universal respect.

There is, however, a growing disposition to consider methods of acquiring wealth, and the man who acquires it by mere skillful dodging of prosecuting attorneys, or without rendering to others and to society anything like a fair equivalent, is apt to be criticised, and to be regarded in an entirely different light from one who makes his money by unexceptionable methods.

Wealth can be and is accumulated in such ways as to benefit others and society, and it can be so used after it is accumulated. On the other hand, it can be, and too often is, accumulated and used in such a way as to prejudice the interests of all others. The great body of the people are quick to recognize the difference, and it is proper that they should be. A Jay Gould should not stand upon the same level as a Peter Cooper.

We believe that the people who do not distinguish between different methods of gaining wealth, but declaim indiscriminately against all possessors of it, are, and always will be, a very small and uninfluential minority.

Eight Hours and the Letter Carriers.

The United States Supreme Court has decided the cases of the two letter carriers, Post and Gates *vs.* the United States, in favor of the carriers. The intent of the law was undoubted, and an ordinary man would have predicted this result. The complainants wanted eight hours to constitute a day's work as provided by the law, but the Post-office Department, with a rather evident intention to nullify the law so far as possible, proceeded to interpret it as meaning that eight hours a day included Sundays as well as other days, and that time not worked on that day should be offset against overtime worked on other days. The decision of the court was that no such offset could be made, and that overtime worked on any single day must be paid for.

Another construction, equally brilliant, was that eight hours as named in the law meant that number of hours actually employed in distributing and collecting mail, and that overtime required of the carriers in the post-office was not to be paid for. This was, as a matter of course, decided against the government, which seems all the way through to have been dragged into a pretty small piece of business.

The question of the policy of making eight hours a legal day's work for those in the employ of the government does not enter. It is a question of keeping faith with employes according to the plain intent of the law governing the matter. There may be—there is—difference in opinion as to the wisdom of the law, but there should be none as to the duty of the government to live up to its own laws. And if the experiment of an eight hour day is to be fairly tried, it seems better that it should be by the government than by a few private individuals, or firms, who might very likely find themselves at a disadvantage in competing with those whose workmen worked longer hours. If the movement for shorter hours is a move in the right direction the government may well be the first to make it and the last to seek to evade it by quibbles. If the law is not satisfactory to the people it should not be a difficult matter to secure its repeal.

At a recent meeting of the Engineering Section of the British Naturalists' Society, Mr. Thomas Morgans read a paper on "Some American Friction Pulleys and Clutches." It was stated that friction devices of this kind were much more frequently used in America than in England, where tight and loose pulleys or claw clutches were more in favor, the latter demanding, of course, the slowing of the shaft motion. Some of the American friction clutch details were shown to "evince considerable mechanical skill and contrivance." Really!

We are informed that a set of apparatus is to be supplied to Sibley College, Cornell University, for making "Keep's Tests" as recently described in our columns, and that henceforth this method of testing will form part of the course of study there.

Literary Notes.

KEY TO STEAM ENGINEERING. Embracing important questions answered concerning the steam engine and boiler. By a practical engineer of large experience. The combustion of coal and its economical use considered Vaporization, ebullition, evaporation, expansion and condensation of water; with an appendix treating on electricity. Third edition, revised and enlarged.

We have noticed a previous edition of this work in our issue of June 25, 1891. This one has been revised and enlarged; the simplicity and comprehensiveness which form the characteristic features of the Mason regulator excellent series have been retained making the book a very valuable and useful one for the practical engineer. The book is divided into three parts; the first part gives answers to important questions relating to the steam engine and boiler; the second part treats on the combustion of coal; and the third part treats on heat and expansion of water, evaporation, etc. In the appendix the electrical terms are defined and parts of the dynamo described. The book is well worth the small price of 50 cents, and should be in the hands of all practical engineers. It is sold by the Mason Regulator Company, Boston, Mass.; and published by Henry S. Williams, 65 Federal street, of the same city.

Mr. Alfred R. Wolff, M. E., who has made a specialty of the heating and ventilation of buildings, has published in pamphlet form a lecture delivered by him before the Franklin Institute, on the above mentioned subject. It is illustrated by diagrams, contains useful tables, and will be appreciated by those who are interested in the subject. It can be obtained by addressing the author at 907 Fulton Building, New York.

One of the first things to be considered by most of those who desire a college or university education is the question of the necessary expense. A great help in answering this question will be found in a pamphlet, a new edition of which has recently been issued by Harvard University, and which is entitled "Students' Expenses." It is compiled by Frank Bolles, Secretary of the University, and may be obtained by addressing him at Cambridge, Mass.

QUESTIONS AND ANSWERS.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(122) B. C. P., Baton Rouge, La., writes: There is a large beer faucet made by a firm in Pittsburgh, which gives great difficulty to keep it tight. We have a great many to grind. What is the best material to grind them with? *A.*—We should use fine sand and soapy water.

(123) S. H., New York, writes: Please give me information relating to machines which cut feathers. It is a kind of a machine which cuts the feathers into small pieces which we call "down." *A.*—We have not seen machines of this class, and cannot give you any information in regard to them.

(124) C. G., Knoxville, Tenn., writes: Please inform me where I can obtain a book of instruction on mechanical drawing. *A.*—We believe the articles on practical drawing, recently concluded in our columns, will answer your purpose. For books treating on the same subject, write to any dealer in scientific works for catalogue.

(125) J. J. H., Plainfield, N. J., writes: Please inform me what horse-power it will take to drive an air compressor whose cylinder is 12 inches diameter and 20 inches stroke, and to give a pressure of 60 pounds per square inch. *A.*—The horse-power will depend on the quantity of air to be delivered, which you have not given.

(126) A. B., Bayonne City, N. J., asks: Why is it that the saddle pins on the links in a locomotive are placed out of center of the links? *A.*—The link saddle pin is placed out of the center of the link for the purpose of obtaining an equal cut off at each end of the cylinder. This has been thoroughly explained in our issues of May 10, 17, 24 and 31, 1884.

(127) R. S. K., Cincinnati, O., writes: I desire to become a competent locomotive engineer. Please advise me of the best course to pursue. *A.*—Send your application to the superintendent of motive power, or apply personally to the foreman of the round-house; he will probably direct you to whom you should apply. After you have obtained a position do your duty manfully, and do not neglect to study during your leisure hours.

(128) R. B., Ashley, Pa., writes: If compressed air of 90 pounds gauge pressure was used to force water, which formed a column 200 feet high in a pipe 12 inches in diameter, what would be the upward velocity provided the air did not blow up through the water, no intermediate piston being used? *A.*—The 90 pounds air pressure will about balance a column of water 200 feet high, and consequently there will be practically no velocity, particularly when friction is considered and as many bends used as indicated in your sketch.

(129) J. C. E., Matanzas, Cuba, writes: Please advise me where I can obtain detailed information on the manufacture of oil from cocoanut, together with the machinery used for the extraction. Please tell me where I may procure a book on this subject, and, if possible, its price. *A.*—This subject is somewhat out of our line, but we believe that the practical treatise on animal and vegetable fats and oils, comprising both fixed and volatile oils, their physical and chemical properties and uses, the manner of extracting and refining them, and practical rules of testing them, by William T. Brannt, will suit your purpose. It can be obtained from D. Van Nostrand Company, 23 Murray street, New York. Price, $7.50.

(130) H. M., Church Point, Canada, writes: I would like to be an engineer. I have tried for over a year to get a position in a machine shop, but there is no work going on, and wages of an apprentice are so low that I could not support myself. One firm offered me $100 the first year and $150 the last year, but cannot take me for some time to come. Where would you advise me to go? I would like to get in some shop where marine engines are built. What wages do apprentices usually get? *A.*—The only advice we can give you is to seek for a place until you obtain one, and if you can get in a small jobbing shop, do not throw the opportunity away, as in such you can probably make faster progress than in a larger shop. After you have served your apprenticeship it will then be time to seek work in such shops as will suit you best. Unfortunately the wages of apprentices are low; those offered to you are very fair. It is doubtful whether you can do any better here.

(131) J. F. Z., Sugar Creek, Ohio, writes: Please give me a simple rule for finding the diameter of gear wheels when the circular pitch and the number of teeth are known. *A.*—Multiply the circular pitch in inches by the number of teeth and divide the product by 3.1416, the quotient will be the diameter of the pitch circle. If, for example, the circular pitch is 1½ inches, and the wheel is to have 30 teeth, then the diameter of the pitch circle will be $\frac{1.5 \times 30}{3.1416} = 14.323$ inches. Since dividing any quantity by 3.1416 gives the same result as by multiplying the quantity by $\frac{1}{3.1416} = .3183$, we may change the foregoing rule to the following: Multiply the circular pitch by the number of teeth, and by .3183, the product will be the diameter of the pitch circle. Applying this rule to the foregoing example, we have $1.5 \times 30 \times .3183 = 14.323 +$ inches for the diameter of the pitch circle.

(132) B. S. O., Middletown, Conn., writes: The pulley on our engine is 36 inches diameter, 10-inch face, and makes 320 revolutions per minute. The driven pulley is of wood 24 inches diameter with 10-inch face. The belt is a 10-inch woven web belt with leather face. The belt plays back and forth from side to side of pulleys, unless very tight. If it is tight enough to run smoothly in dry weather it is too tight in damp weather. I have crowned the wooden pulley to match the engine pulley, or a little more; the latter has $\frac{3}{16}$ inch crown, but it does not remedy the difficulty. The shafting is in line and level, and the pulleys seem to be balanced. Can you give me suggestions as to obviating the difficulty without using an idler? *A.*—It is difficult to locate the cause of trouble without examining the plant. The cause may be due to a light fly-wheel, giving an irregular motion to the pulleys, or it may be due to an unequal tension in the sides of the belt; if due to any of these causes the remedy will suggest itself. It may be necessary to use another kind of belt.

(133) H. B., Portville, N. Y., writes: We would like to have your opinion on what kind of engine and boiler, the former 25 horse-power, and the latter 35 horse-power, would be best adapted to put in a feed-mill for continuous hard work, and get the most work out of a pound of coal without too much complication. *A.*—We cannot recommend, either privately or through our columns, any particular kind of engine or boiler in preference to others. The best course to pursue in all cases of this kind is to engage the services of a mechanical engineer who has had experience in this line, and who cannot afford to lose his reputation. 2. Would it pay to use a condenser in connection with a throttling engine of this size? *A.*—That depends on the surrounding circumstances of the steam plant. If the water for condensing purposes has to be drawn through a distance exceeding 500 feet, and through a lift exceeding say about 20 feet, and the conditions are not favorable for the water to flow by gravitation towards the engine, a condensing engine would not give satisfactory results. Or if the exhaust steam, say of a half-pound pressure or more above the atmosphere, is required for purposes outside of the engine, the condensing engine will not be admissible. 3. Would 4 pounds of soft coal per horse-power per hour do the work? *A.*—Yes.

(134) Alban, London, Ont., writes: What is the method usually adopted, and what material is used for japanning sheet-iron or steel cheaply, after the manner of that used for corset steels and other work of a similar character? If used in the shape of dipping liquid or heated in an oven please give the best temperature at which to work. *A.*—Japanning is done in clear transparent varnishes, in black and in body colors; but black japan is the most characteristic and common style of work. The varnish for black japan consists essentially of pure natural asphaltum with a proportion of gum animé dissolved in linseed oil and thinned with turpentine; but there are numerous receipts given for the varnish, and manufacturers generally conceal the composition of their own preparation. In thin layers such a japan has a rich dark-brown color, and only shows a brilliant black in thicker coatings. For fine work, which has to be smoothed and polished, several coats of black are applied in succession, each being separately dried in the stove at a heat which may rise to near 300 degrees Fahr. Body colors consist of a basis of transparent varnish mixed with special mineral paints of the desired colors or with bronze powders. The transparent varnish used by japanners is a copal varnish which contains less drying oil and more turpentine than is contained in ordinary painter's oil varnish.

(135) A. B. S., Memphis, Tenn., sends us a sketch of an upright boiler, in which the gases pass upwards through 126 3-inch tubes and then pass downwards through an outer row of 24 6-inch flues, and finally pass upwards through a space left between the 6-inch flues and the outer shell, and out through the smoke stack placed centrally on top of boiler. He asks: Do the 6-inch flues have enough area to accommodate the gases which pass through the 3-inch tubes? *A.*—The aggregate area of the 6-inch flues is not as great as that of the 3-inch tubes, but since the area of the latter is greater than is required for carrying off the gases, it is not necessary that the area of the 6 inch flues should be equal to that of the 3-inch tubes. But we believe that 30 6-inch tubes will give better results than 24. 2. What would you consider to be the proper area for the bottom of the smoke stack directly above the boiler? *A.*—We should make it equal to one-eighth of the area of the grate surface; this will give a smoke stack 23½ inches diameter. 3. The arrangement shown in sketch has never given satisfaction. There are two boilers of the same type and size in the plant, each has a 30 inch outlet into a 72-inch chimney 60 feet high. *A.*—The trouble may lie in the general construction of the boilers; your sketch is not complete enough for us to give an opinion. But we believe the main cause of the trouble is in the chimney which is too large for two boilers of this kind.

(136) H. H., Indianapolis, Ind., asks: How large a boat can be driven at a rate of 8 or 9 miles an hour with an engine 2½x3 inches? *A.*—About 16 feet long, 4 feet 6 inches wide, and 2 feet deep. If the lines of the boat are fine and correctly designed you may obtain a speed of 8 miles an hour. 2. I would like to make the boat of sheet iron; do you think No. 18 iron would be too light for the sides if well braced? *A.*—No. 18 B. W. G. would be about right; but we would not recommend the use of iron or steel for small boats under any circumstances, as it is exceedingly difficult to get a neat smooth job in the first place. Then the plates are so easily dented, and finally they soon rust through even with the best of care. No. 18 B. W. G. weighs very nearly 2 pounds per square foot, and ⅞-inch cedar planking will not exceed 1½ pounds per square foot, so that the wooden boat would be the lighter. 3. What form of boiler would be the best to use? *A.*—We should use a plain upright boiler of the type illustrated in our issue of March 27, 1890. The boiler there shown was designed for stationary purposes. For marine purposes, the height of fire-box and the total height should be considerably reduced, so as to bring the center of gravity as low as possible. 4. Do you think No. 6 sheet copper would stand 60 pounds pressure in a shell 12 inches in diameter? *A.*—Yes; but we should not advise you to use copper sheets in the boiler; steel, we believe, will give far better results. 5. What size screw should I use for the desired speed? *A.*—Diameter 14 inches; pitch 24 inches.

(137) W. M. S., St. Louis, Mo., writes: I wish to ascertain the correct position for the feed water pipes on boilers. *A.*—See answer to Question 571 in our issue of December 29, 1892. 2. Please indicate the proper position for a fusible plug in a tubular boiler. *A.*—Fusible plugs are inserted at convenient points in plates liable to be the first to be left dry on the falling of the water level. In tubular boilers the most convenient place will be in the front tube sheet close to the top of the upper row of tubes. Of course, in this position the escaping steam and water, after the fusible metal has been melted, will have no or very little tendency to put out the fire, as is usually expected when the fusible plug gives warning of low water. Everything considered, it is very doubtful whether a fusible plug will answer its purpose in tubular boilers. In marine boilers the plugs will have to be placed according to the rules and regulations prescribed by the Board of Supervising Inspectors of Steam Vessels, which read as follows: All steamers shall have inserted in their boilers plugs of Banca tin, at least one-half inch in diameter at the smallest end of the internal opening, in the following manner, to wit: Cylinder boilers with flues shall have one plug inserted in one flue of each boiler, and also one plug inserted in the shell of each boiler from the inside, immediately before the fire line, and not less than four feet from the forward end of boilers. All fire box boilers shall have one plug inserted in the crown of the back connection, or in the highest fire service of the boiler. All upright tubular boilers used for marine purposes shall have a fusible plug inserted in one of the tubes at a point at least two inches below the lower gauge cock, and said plug may be placed in the upper head sheet when deemed advisable by the local inspectors. All fusible plugs, unless otherwise provided, shall have an external diameter not less than that of a one inch gas or steam pipe screw tap, except when such plugs shall be used in the tubes of upright boilers; plugs may be used with an external diameter of not less than that of a three-eighths of an inch gas or steam pipe screw tap, said plugs to conform in construction with plugs now authorized to be used by this board; and it shall be the duty of the inspectors to see that these plugs are filled with Banca tin at each annual inspection.

(138) C. H., Detroit, Mich. writes: Please inform me how I can mold small articles in rubber, which, after molding, must be soft like sheet rubber. Please tell me where I can obtain a small vulcanizer, and its cost. Are there any books treating on molding rubber? *A.*—We referred these questions to Mr. John T. Usher, who replies as follows: The molds for soft rubber are the same as for hard rubber, and any article can be made either of hard or soft rubber in the same mold, but when the articles are made of soft rubber no provision need be made in the molds for removing the articles (after they have been vulcanized) from the molds, as in the case of hard rubber when metal molds are used; for when the articles are made of soft rubber they can be easily pulled out of the mold if the latter is correctly made. Your correspondent should experience no difficulty in making a metal mold without any special appliances except some molding sand, a ladle, and some white metal or good babbitt metal, following instructions given in the issue of the AMERICAN MACHINIST of March 19th, 1892, or if he wants to make the articles in plaster molds he should make them right in the flasks, as per issue of October 6th, 1892. With regard to the soft rubber, of which mention is made, your correspondent is very indefinite on this point, though I presume he refers to the kind of rubber of which hand stamps are made. If he does then this kind of rubber can usually be vulcanized in the steam vulcanizer in practically the time taken to raise the temperature to the vulcanizing point, and then cooling off slowly, as explained in issue of the AMERICAN MACHINIST for February 23d, holding the temperature at the vulcanizing point for about five minutes, and then shutting off the heat and allowing the vulcanizer and contents to cool off, as therein explained. The vulcanizing of the rubber being really accomplished while the vulcanizer and contents are being heated to the vulcanizing point, and then cooled off to or below the lowest vulcanizing point. The object in holding the temperature at the vulcanizing point for five minutes is to allow of the heat penetrating to the interior of the molds. It is possible that the above-mentioned rubber may not be suitable for your correspondent's purpose. I should think the best rubber for his purpose would be the flexible rubber used by dentists when it is necessary to make a soft palate in an artificial denture. If the latter rubber is used it is vulcanized the same as the hard rubber (though it never gets hard). With regard to the former (hand stamp) rubber, this can be vulcanized by improvised methods, as shown in issue of the AMERICAN MACHINIST December 1st, 1892, but as therein explained it is always best to use a vulcanizer. It is more than probable, though, that your correspondent may have to have his rubber made to order if he is desirous of having any particular color and amount of elasticity in the rubber, in which case the rubber can be made to be vulcanized in any time desired. The most popular vulcanizer in use is the "Whitney" as made by the Buffalo Dental Manufacturing Co., Buffalo, N. Y. It is made in three sizes, 4″ diameter by 3″ deep to hold one "flask"; 4″ diameter, 4½″ deep to hold two flasks; 4″ diameter, 6½″ deep to hold three flasks; the cost is $12 one flask, $14 two flask, and $16 three flask; these prices include flasks, wrenches and gas or kerosene heater and jacket. The articles you have published on the subject of rubber work are the only practical ones I know of, and your correspondent can, if he reads and follows the instructions therein given, will find all the information necessary to make any articles he may wish to make of rubber.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Grant Gears. Lexington and Phila. See page 11.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Ideal Drawing Stands. M. C. Hammett, Troy, N. Y.

Forming Lathes Mer. Mach Tool Co., Meriden, Ct.

Tool Holder: Armstrong Bros. Tool Co., Chicago.

Norway Rivets, Evans & Robertson, Cincinnati, O.

Ideal Drill Grinder. Thos. Hall, 853 B'way, N. Y.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

Pattern and Brand Letters. A variety of sizes and styles. Heber Wells, 8 Spruce St., New York.

Drill Presses, with Tapping Attachments.
Gould & Eberhardt, Newark, N. J.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty St., N. Y.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt St., N Y.

Pulley lathes, most efficient offered. The Lodge & Shipley Machine Tool Co., Cincinnati, O.

Engine Castings, Humphrey's Foundry, Bellefontaine, O.

For Cypress Tanks and Vats, address W. E. Cald Well Co., Floyd and Main Streets, Louisville, Ky.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

"Shapers (Double Triple Quick Stroke")
Trade Mark.
Gould & Eberhardt Newark, N. J.

For the Latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., corner Canal and Washington Sts., Chicago, Ill.

Combination, duplex and special gear cutters in stock and to order. vertical milling machines. R. M. Clough, Tolland, Conn.

20″ lathes—24″x24″ planers. Write for price before buying elsewhere. F. C. & A. E. Rowland, New Haven, Conn.

Gear Cutters, Auto. Specially adapted for Motor Gears and all other style Gears.
Gould & Eberhardt, Newark, N. J.

S. W. Card & Co., Mansfield, Mass., are putting on the market a new line of stocks and dies, with their patent adjustable dies and guide. S. A. Smith, 23 S. Canal Street, Chicago, Ill., Western Agent.

Patent Soliciting of High Class.
D. Walter Brown, Counsel in Patent Cases,
31 Nassau Street, New York.
Send for Brief History of Patent Legislation.

Sidney, Ohio, offers cash inducements to manufacturers to locate. Iron manufactories preferred. Correspondence with responsible parties solicited. J. K. Cummins, Secretary Improvement Board.

De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. AMERICAN MACHINIST PUBLISHING CO., 203 Broadway, New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2 postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

Something About Compressed Air.

BY FRANK RICHARDS.

The air compressor is the ideal field for the use of the indicator. So far as I know, a steam-actuated air compressor is the only machine where the indicator can be applied and be found to tell the whole story of the power developed and of the work done. In the steam pump the report of the card of the water cylinder is affected by questions relating to the inertia of the body of water. With a steam engine of any type there is always some uncertainty about the friction of the working parts of the engine. We can take what we are pleased to call the friction card, when the engine is running without doing any external work, and we know what resistance the steam has to overcome at that time; but that tells us comparatively little of the resistance of the engine when loaded. We know that the friction of nearly every working part of the engine increases with the load, but when the load is on, we don't know from the indicator card

how much of it indicates load or how much of it belongs to the friction of the engine, and to get the result with any certainty and accuracy it is necessary to employ some form of dynamometer in connection with the indicator. In the government tests of the new war ships we have to take the testimony of the indicator as the best available evidence; but it is quite possible that the actual power used by the screw acting upon the water for propulsion may not bear a constant relation to the mean effective of the indicator card on account of the varying and undetermined friction of the working surfaces. But what a "job" it would be to apply a dynamometer to the steamship "Indiana." So when different parties hire power from the same engine in a building, and have the power consumed computed from indicator cards they have to pay for some power that they don't get, and what they do use is a more or less uncertain quantity.

In the case of the air compressor this is different. By taking cards from both the steam and air cylinders at the same time, or when the compressor is running under similar conditions, we get the whole statement of the power consumed and of the actual work done. The difference between the indicated horse-power of the two cards will represent the power that has been expended merely to keep the machine in motion.

TABLE OF VOLUMES, MEAN PRESSURES PER STROKE, TEMPERATURES, ETC., IN THE OPERATION OF AIR COMPRESSION FROM 1 ATMO. AND 60° FAHR.

1	2	3	4	5	6	7	8
Gauge Pressure.	Absolute Pressure.	Atmo's.	Volume with air at constant temp.	Volume with air not cooled.	Mean pressure per stroke; air constant temp.	Mean pressure per stroke; air not cooled.	Temp. of air; not cooled.
0	14 7	1	1	1	0	0	60°
1	15.7	1.068	.9363	.95	.96	.975	71
2	16.7	1 136	.8803	.91	1.87	1.91	80 4
3	17.7	1.204	.8305	.876	2.72	2 8	88 9
4	18.7	1 272	.7861	.84	3 53	3.67	98
5	19.7	1 34	.7462	.81	4.3	4.5	106
10	24.7	1 68	.5952	.69	7.62	8.27	145
15	29.7	2.02	.495	.606	10 33	11 51	178
20	34 7	2 36	.4237	.543	12.62	14 4	207
25	39 7	2 7	.3703	.494	14.59	17 01	234
30	44 7	3.04	.3289	.4638	16 34	19 4	252
35	49 7	3 381	.2957	.42	17 92	21.6	281
40	54.7	3.721	.2687	3.8	19.32	23.66	302
45	59.7	4 061	.2462	.37	20 52	25.59	321
50	64 7	4 401	.2272	.35	21.79	27 39	339
55	69.7	4 741	.2109	.331	22.77	29 11	357
60	74 7	5.081	.1968	.3144	23 84	30 75	375
65	79 7	5.423	.1844	.301	24 77	31.69	389
70	84.7	5.762	.1735	.288	26.	33 73	405
75	89 7	6.102	.1639	.276	26.65	35.23	420
80	94 7	6 442	.1552	.267	27 33	36.6	432
85	99.7	6 782	.1474	.2566	28.05	37 94	447
90	104 7	7.122	.1404	.48	28 78	39.18	459
98	109.7	7 462	.134	.24	29 53	40.4	472
100	114.7	7 802	.1281	.232	30.07	41 6	485
105	119 7	8.142	.1228	.2254	30.81	42 78	496
110	124.7	8.483	.1178	.2189	31 39	43 91	507
115	129 7	8 824	.1133	.2129	31.98	44.98	518
120	134 7	9 163	.1091	.2073	32.54	46 04	529
125	139 7	9 503	.1052	.2020	33 07	47.06	540
130	144.7	9 843	.1015	.1969	33 57	48.1	550
135	149 7	10.183	.0981	.1922	34 05	49.1	560
140	154.7	10 523	.095	.1878	34 57	50 02	570
145	159 7	10.864	.0921	.1837	35.09	51.	580
150	164.7	11.204	.0892	.1796	35 48	51 89	589
160	174.7	11.88	.0841	.1722	36.29	53 65	607
170	184.7	12.56	.0796	.1657	37 2	55.39	624
180	194 7	13.24	.0755	.1595	37 96	57 01	640
190	204.7	13.92	.0718	.154	38 68	58 57	657
200	214.7	14.6	.0685	.149	39.42	60.14	672

The accompanying table will be found convenient in working up cards, and in general computations upon the duty of air compressors. It is thought that it requires little explanation. The first three columns are, of course, different forms of the same thing—the pressure to which the air is compressed. Throughout the table the air is assumed to be compressed from an initial pressure of one atmosphere and a temperature of 60° Fahr.

Column 4 gives the volume of air after compression to the given pressure and after it is cooled to its initial temperature. As far as the compressor is concerned this column represents an eternally unattainable ideal. The compressed volume while in the compressor, or at the moment of discharge, will always be greater than given in the table for the corresponding pressure, because it is impossible to compress air and at the same time abstract all the heat of compression from it. This column does, however, give the volume of air that will be realized if the air is transmitted to some distance from the compressor, or is allowed to give up its heat in any way. Air will be found to lose its heat very rapidly, and this column may be taken to represent the volume of air after compression available for the purpose for which the air has been compressed.

Column 5 gives the volume of air more nearly as the compressor has to deal with it. In any compressor the air will lose some of its heat during compression. The slower the compressor runs the cooler the air and the smaller the volume. High or excessive speeds are not in the interest of economy for many reasons. If the cylinder and heads are water-jacketed the cooling of the air and the reduction of volume, and of mean effective resistance, will be quite appreciable; but in any compressor cylinder within my knowledge the actual volume will be nearer the figures as given in column 5 than to those in column 4.

Column 6 gives the mean effective resistance to be overcome by the air cylinder piston in the stroke of compression, supposing the air to remain constantly at its initial temperature. Of course it will not so remain, and instead this column remains the ideal to be kept in view and striven for in economical air compression.

Column 7 gives the mean effective resistance to be overcome by the piston, supposing that there is no cooling of the air. As we have seen there is more or less—generally less, but always some—cooling of the air, so that the actual mean effective will be somewhat less than as given in this column; but for computing the actual power required for operating air compressor cylinders the figures in this column may be taken and a certain percentage added—say 10 per cent.—and the result will represent very closely the power required by the compressor.

It seems proper here to suggest one caution as to the use of this column. The mean pressures given being for compression from one atmosphere upward they will not be correct for computations in compound compression or for any other initial pressure. Thus the mean effective in column 7 for compressing to fifty pounds gauge pressure is 27.28, that is, increasing the pressure 50 pounds by the gauge, but it does not follow that we could take air at fifty pounds gauge pressure, and compress it to 100 by the same mean effective. In the latter case the mean effective required would be 40.21.

Column 8 gives the theoretical temperatures of the air after compression to the pressures indicated.

Not many machinery manufacturers are able to avail themselves of so many arguments in favor of the use of their machines as are the bicycle manufacturers, who push their products on grounds of fashion, healthfulness, and of general utility. The latest publication bearing upon the subject is entitled, "The Bicycle in Its Relation to the Physician," being an address upon this subject by Seneca Egbert, A. M., M. D., of Drexel Institute, Philadelphia. It is reprinted in pamphlet form from the *University Medical Magazine*, and is thus published by Albert A. Pope, of Boston, who, we suppose, will furnish it upon application.

Mr. J. B. Edwards, who commenced his mechanical career in Springfield, Ohio, afterwards being employed on watch tools at Elgin, and finally with the Western Electric Company, at Chicago, sails on the 22d for Antwerp, Belgium, where he will have charge of the Antwerp factory of the Western Electric Company. This company is closely identified with the Bell Telephone Company, and the principal business of the Antwerp factory is the manufacture of telephones for use in Europe. About 500 men are employed there, the heads of departments being mostly Americans.

Among the modern mechanical wonders may be classed the telephone switch boards used in large cities. There are several of these in New York that are remarkable, but the largest is that in Cortlandt street, and which serves for some 6,000 subscribers in the "down-town" or business section of the city. It cost in the neighborhood of $500,000, and has about 40 miles of electric cable entering into its construction.

MANUFACTURES

A cigar factory is to be established at Farmer City, Ill.

New water-works are to be put in at Fairbury, Ill., this spring.

A new furniture factory is to be started at Tuscola, Ill.

The Pepperell Company will erect a new mill in Biddeford, Maine, this spring.

A Phillips (Me.) paper says that a novelty-mill will be built at that place during the coming season.

The Gibson Novelty Works, at Gibson City, Ill., has been issued articles of incorporation. Capital stock, $8,000.

South Norridgewock, Maine, is likely to have a new industry established in the shape of a butter and cheese factory.

The Naperville Lounge Company, at Naperville, Ill., has been incorporated with a capital stock of $10,000, for the manufacture of furniture.

Articles of incorporation have been issued to the Monmouth, Ill., Sewer Pipe and Tile Company. The new institution has a capital stock of $50 000.

The St. Croix Shoe Company, Calais, Maine, are considering the practicability of manufacturing leather garments in addition to their shoe business.

The Campbell Printing Press and Manufacturing Company, New York, has issued a new catalogue of printing presses and attachments, folding machines, etc.

The Peter F. Bryce Bakery Company, of Indianapolis, Ind., is making extensive improvements to its plant in South street, preparatory to increasing largely its producing capacity.

The Richards Paper Company, Gardiner, Maine, have voted to rebuild their pulp-mill, lately burned, if the insurance adjustment is satisfactory and agreeable arrangements are made with the bondholders.

W. C. Buddenbaum has just completed on East Market street, Indianapolis, Ind., a three-story building 100 feet long by 80 feet wide, in which he will put in a planing-mill, door, sash and blind factory.

W. R. Close, of Bangor, Maine, is to begin the erection at Lincolnville this week of one of his patent lime kilns. If the kiln is a success a syndicate will be formed for the manufacture of lime on a large scale at Lincolnville.

Carlton & Bearce, of Woodland, Me., have sold their mill to Messrs. Tornquist & Johnson, of New Sweden, Maine, reserving the use of it for one month, to saw out their stock of cedar. The mill will be removed to New Sweden.

The old frame buildings on Kentucky avenue, Indianapolis, Ind., owned by John Guedelhœfer, are being torn down, and in their place he has contracted to erect a four-story building 195 feet long by forty wide, constructed of brick, resting on a stone foundation.

Dean Brothers, steam pump manufacturers, have the plans for their new shops, on First street and the Big Four tracks, Indianapolis, Ind., completed, and will, within a short time, advertise again for bids, having made some changes on the plans they prepared last fall.

There is water-works agitation at Marietta, O.; Clarksville, Tenn.; St. Paul, Minn.; New Wilmington, Pa.; Providence, R. I.; Cleveland, O; Lisbon Falls, Me.; Lexington, Ky.; Union Springs, Ala; Oyster Bay, L. I.; Sacramento, Cal; Boston, Mass.; Luverne, Minn; Lancaster, O.; Washington, Kan.

The Indianapolis Chair Company, Indianapolis, Ind., has its new building completed and most of the machinery in position, making it one of the largest plants of this character in this country. Some 350 men are now employed at the works, and the number is to be still further increased.

A new one story foundry building, 80 feet front and 100 feet deep, is being added to the works of the Globe Iron and Foundry Company, on Ninth and Victor streets, St. Louis, Mo. Twenty men will be employed at the start in the new department, and others will be added as the increase of business requires. The company is quite busy on house work—railings, store fronts, etc.

W. K. Dana and Hebron Mayhew, of Westbrook, Maine, have purchased a valuable waterpower and 16 acres of adjoining land at the falls in Mousam River, near West Kennebunk. The waterpower is said to be extensive and the water excellent for dyeing purposes and for paper making. The purchasers state they will, if a lease can be secured with the right parties, construct a mill and make any other improvements that may be required.

The Parry Manufacturing Company, of Indianapolis, Ind., has decided to tear down the extensive drying sheds erected some years ago on the corner of Illinois and Garden streets, and on this place erect a four-story brick building having a frontage of 220 feet on Illinois street, and running back on Garden street 226 feet. The company is also negotiating for a right of way by which it can lay a switch from the switch leading to the Premier Steel Works to its establishment.

W. Jessop & Sons, Limited, of Sheffield, England, and New York, the well-known steel makers, count themselves one hundred years old this year. The business was started by William Jessop, at Sheffield, in 1793, and has been continued by his sons and their descendants. The works have grown to be amongst the largest of the kind in the world, and are largely represented in the principal cities in the United States and Canada. In addition to cast steel of all shapes and for all purposes, the firm are large makers of steel castings. The New York office is at 91 John street.

The Armour Packing Company has been incorporated under the laws of New Jersey with a capital of $7,500,000. The company proposes to do business in that State at Jersey City and Newark and throughout the United States and Europe, with its principal office in Jersey City. Its business will be the manufacture of all kinds of products from food animals. The incorporators are H. O. Armour and Frank Platt, of New York; Charles W. Armour, of Kansas City; Charles Richter and Fred. V. Dare, of Brooklyn; Theo. F. Wood, of Orange, and Llewellyn E. James, of Kansas City, Kan.

The Dominion Coal Company (limited), which is the legal title of the now famous Whitney syndicate that has bought up and secured control of the Cape Breton coal mines for the next 100 years, has organized with the following officers: President, Henry M. Whitney, Boston; treasurer, John S. McLennon, Montreal; secretary, B. F. Pearson, Halifax, N. S.; chief engineer and general manager, F. S. Pearson, Boston; resident manager in Nova Scotia, Hon. David McKeen, Cape Breton; directors, Henry M. Whitney, Boston; W. C. Van Horne, Montreal; Sir Donald Smith, Montreal; Hugh McLennan and William B. Ross, Halifax; H. F. Dimock, New York; Alfred Winsor, Boston; F. S. Pearson, Boston; Robert Winsor, Boston. Of the management of the new concern six directors and the secretary are Canadians.

Machinists' Supplies and Iron.

New York, March 18, 1893.

Iron—American Pig—We quote Standard Northern brands, No. 1 Foundry, $14.75 to $15.25; No. 2, $14 to $14.50; Gray Forge, $13 to $14. Southern brands of good quality are obtainable at $14.75 to $15 for No. 1 Foundry; $13.75 to $14 for No. 2; and $12.75 to $13 for Gray Forge.

Antimony—The market is steady. We quote L. X., 10⅝c. to 10¾c.; Cookson's, 10½c. to 10¾c.; Hallett's, 10c. to 10¼c., and U. S. French Star, 10⅛c.

Copper—The market is easy; 11¾c. to 12c. is asked for Lake Copper, but this does not attract business. Casting Copper is held at 10⅞c. to 11¼c.

Lead—The market has a firmer tendency with 3.92½c. bid, and 395c. to 4c. asked for car loads. Inquiries are on the increase, and a larger business is looked for.

Lard Oil—Prime City is quoted at $1.00 to $1.02.

Spelter—Offerings of spot supplies are limited, and sellers are still quoting high prices, but probably 4.27½c. would buy April supplies. There is no business, but inquiries seem to be on the increase.

Tin—The market is firmer; for small sales 21c. is bid, and 21.25c. asked for spot supplies.

✲WANTED✲

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Wanted—Salesmen on commission, to push a special line of mach'y. "Kirk," care of Am. Mach.

Head draftsman for marine and general eng. works, wants change. X. Y., Am. Machinist.

Designer and draftsman, technical graduate, with shop exp., wants position. Box 24, Am. Mach.

Wanted—Good metal model makers; good pos. to exp'd party. Tnurman & Scullin, Indianapolis, Ind.

Wanted—Several 1st-class, gen. mach., 113 & 115 Plymouth St., Jersey City. Shop new and pleasant.

Draftsman (designer), machine tools, fixtures and general mach'y, desires pos'n H. M., Am. Mach.

Wanted—Position as draftsman; 4 years' experience. Address Box 61, American Machinist.

Wanted—A good mech. draftsman, one who has worked on printing press machinery pref'd; state exp. and wages expt'd. Box 23, Am. Machinist.

Wanted—A man of exp. in erecting and testing duplex pumps, to take position with a western pump factory. "Duplex," care Am. Machinist.

Mech. engineer, college graduate, 15 years of practical experience, desires sit. as supt., assistant supt., mech. engineer or designer. B., Am. Mach.

A mech. and electrical eng., 7 years professor of mech. engineer'g in a high grade college, is open to prof'al or bus. engagement. E. M. F., Am. Mach.

Situation wanted by a first-class tool dresser and steel worker; can do forging if required; best of references. Box 57, American Machinist.

A foreman pattern maker desires a change. Am posted on steam pump and engine work, etc. Address P., American Machinist.

Wanted—An experienced and competent man as superintendent in a carriage hardware manufactory. Manufactures, Box 58, American Machinist.

Wanted—A first-class wood pattern maker for plumbing brass work; apply to Ahrens & Ott Mfg. Co., Louisville, Ky.

Wanted—Machinery blacksmith that can use power hammer. Also man for heavy lathe, and several floor hands. Box 48, Am. Machinist.

Wanted—Position as foundry foreman; one who is accustomed to first-class work. Address H. G., Box 53, American Machinist.

Wanted—1st-class brass molder to take charge of foundry. State experience and salary. Apply James Morrison Brass Mfg. Co., Toronto, Ont.

Wanted—Pattern makers on heavy machinery work. None but 1st class workmen of good habits need apply. Farrel F d'y & Mach. Co., Ansonia, Ct.

Wanted—Foreman for machine shop for a car works; must be under 40 years of age. Address V. 5, care Lord & Thomas, Chicago, Ill.

Superintendent, with 1st-class experience on interchangeable machinery, wants situation in vicinity of New York City; good reasons for leaving present pos.; good reference. O. X., AM. MACH.

Wanted—Two or three 1st-class draftsmen. Must be good designers, and have had shop experience. Preference will be given to those having worked on electrical machinery. Box 56, AM. MACH.

Wanted—An exp'd man to take charge of a modern locomotive blacksmith shop. In answering, please give references, state age and experience, and salary expected. Smith, AM. MACH.

A steady and competent young mechanic would like position to take charge of automatic machines, has held similar position; or as a machinist; has had tool room experience; best ref. Box 51, AM. MACH.

Wanted—A 1st-class tool and die maker for making punching dies. Permanent situation and good wages to the right man. Address Dupaul, Young Optical Co., Southbridge, Mass.

Wanted—By a practical tool maker and machinist, a situation with a firm of modern shop practice; present position, charge over tool department. Reference given; age, 33. Box 52, AM. MACH.

Wanted—By a thorough and experienced machinist foreman, position as such or superintendent. Well up in modern shop practice; best methods handling piece-work, etc. N., AM. MACH.

Mech. engineer wants situation as supt., assistant supt., or chief draftsman. 15 years' practical experience on machine tools, eng. and electric machinery; best refs. Theory & Practice, AM. MACH.

Wanted—Position as foreman of shop running 25 to 50 men; well up on jig and interchange methods; references. Address Energy, AM. MACHINIST.

Wanted—Draftsmen, two mechanical draftsmen, first-class men to work on machine tools, men with experience on this class of work preferred. P. O. Box 1527, Fitchburg, Mass.

Wanted—Foreman for machine shop manufacturing wood-working machinery; must be a good mechanic, and well acquainted with modern machine shop practice; state age, experience, and salary expected. Address I., Box 26, AM. MACHINIST

Wanted—Member A. S. M. E., superintendent of large works, desires similar position in Philadelphia about June 1st. 18 years exp. covering machine tools, general machine and iron work, & electric railroad & lighting mach'y. Box 59, AM. MACH.

Wanted—Steady employment given to a good turret lathe hand in a large, pleasant Ohio town. Must be a temperate man of family and steady habits, and a good workman. Address L. B., care of AMERICAN MACHINIST.

Wanted—One good draftsman and designer of steam engines and general work, must understand the steam engine thoroughly. State age, exp., habits and salary expected, and how soon you can come. Box 300, AM. MACHINIST, New York.

We will pay 25 cents each for copies of the AMERICAN MACHINIST of December 4, 1886 issue; must be unsoiled and in good condition. AMERICAN MACHINIST PUBLISHING COMPANY, 203 Broadway, New York.

Pos. wanted by young man, mach.; understands thoroughly manufacture of steam pumps; also the office work and selling of same. Box 54, AM. MACH.

First-class pattern maker desires situation as foreman; experienced in heavy machine tools, etc. Age, 36. Address Box 60, AMERICAN MACHINIST.

Polytechnic graduate, having wide practical experience as designer and salesman of high-duty steam machinery, would like to represent first-class builder in New York office. References given. Address R. I. G., AMERICAN MACHINIST.

Wanted—Engineers and others interested in devices for regulating pressures of steam, water, gas or air, or for governing and regulaing the action of pumps, to send their address to the Foster Engineering Co., Newark, N. J.

Wanted—A foreman for machine shop in Western Pennsylvania manufacturing portable engine and gen. machine work; must be thoroughly up in modern machine shop practice and understand methods of producing work cheaply; give reference, age and salary expect'd. Box 39, AM. MACH.

Machinist and draftsman (designer) 3½ years in this country, who is master of 4 languages, wishes to represent or act as interpreter for one or several concerns at the Columbian Exhibition; had a similar position at the Paris Exposition of 1889; can give first-class American and foreign references. Address L. E. F., AMERICAN MACHINIST.

Wanted—A competent, energetic foreman or superintendent, to take charge of concern manufacturing a general line of brass and iron steam appliances. Must be a pusher; competent to handle 150 men or more to best advantage; well up in modern shop practice and the methods employed for rapid work. State age, experience, and salary expected. Box 44, AMERICAN MACHINIST.

Wanted—By a millwright and machine concern in large Ohio River City, foreman for machine shop working from 4 to 8 men; only those with experience and ability to handle men, and turn out work cheaply and rapidly, need apply. Northern man preferred. Address, with particulars, stating age, nationality and experience, Foreman, Box 55, AMERICAN MACHINIST.

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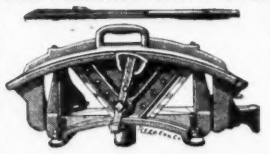

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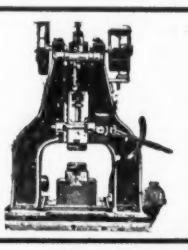

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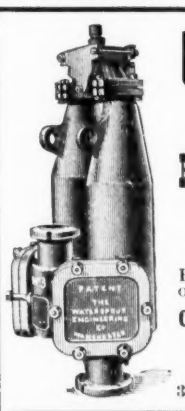

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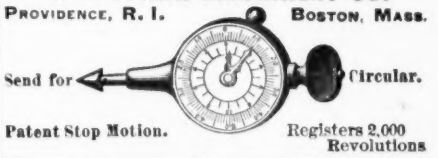

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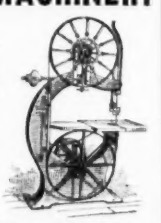

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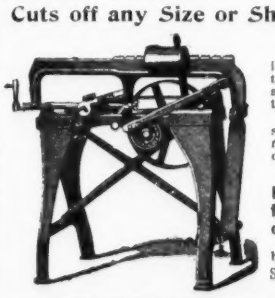

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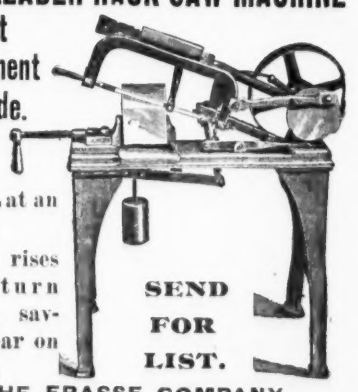

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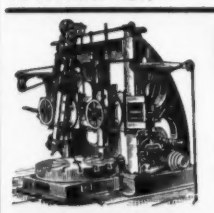

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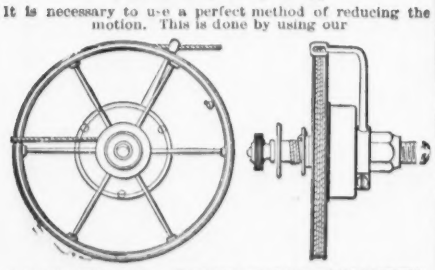

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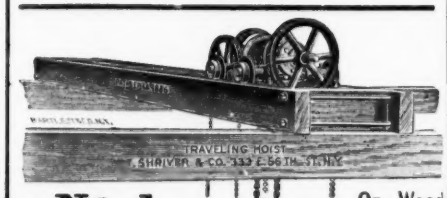

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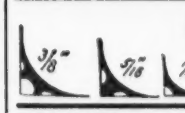

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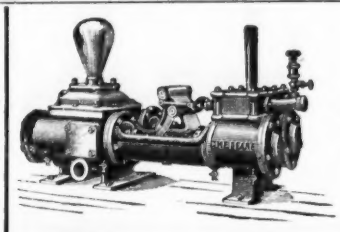

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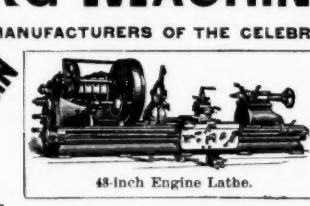

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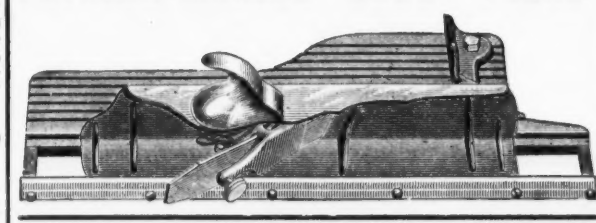

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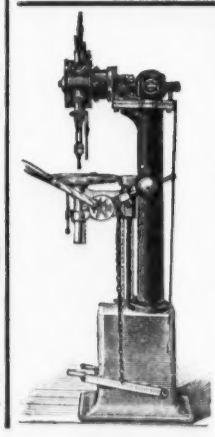

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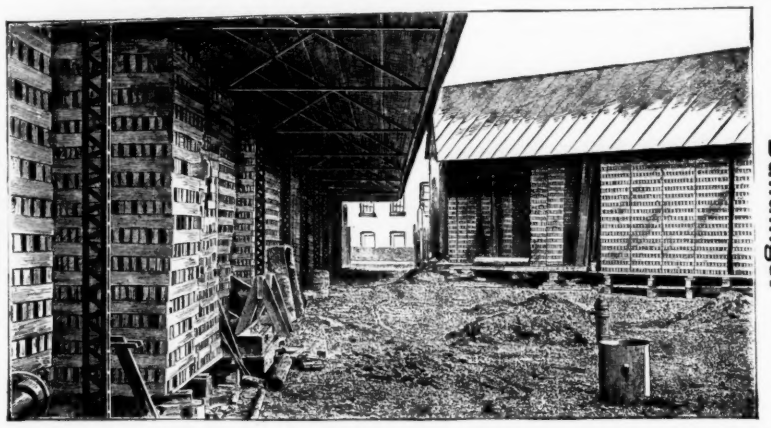
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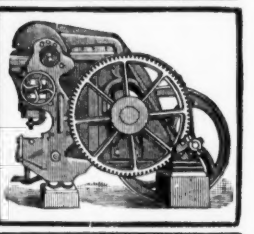

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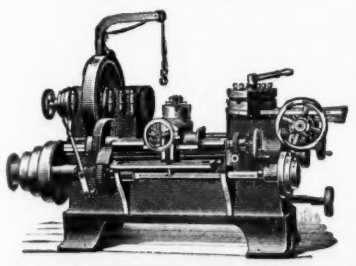
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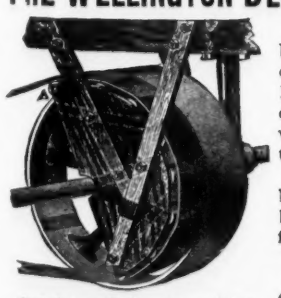
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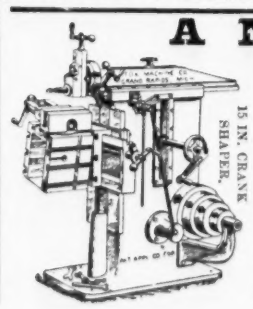

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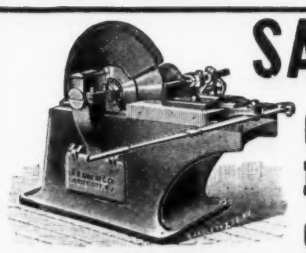
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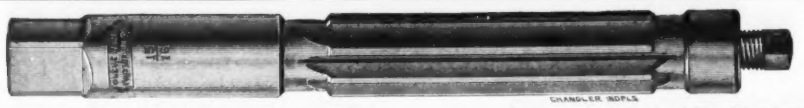

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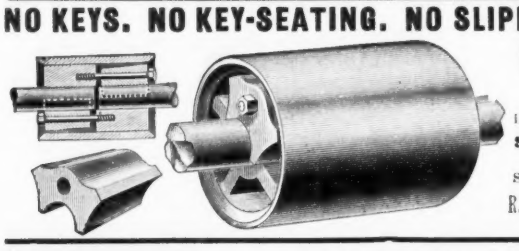

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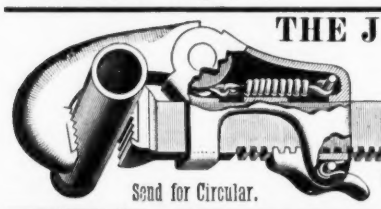

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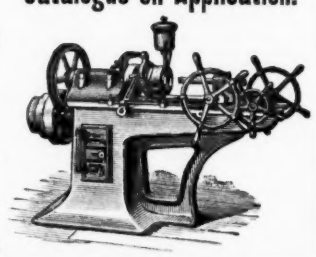

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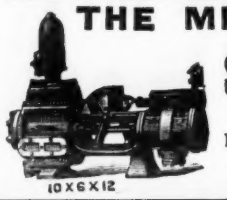
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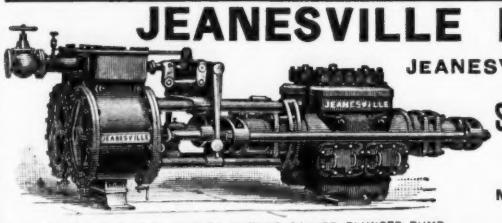
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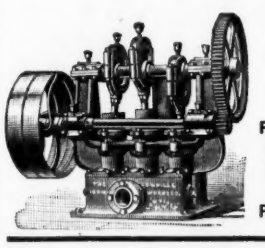

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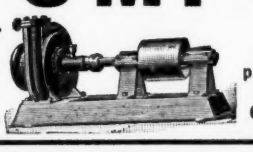

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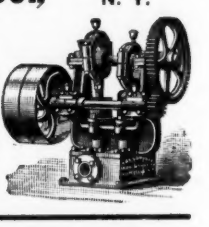

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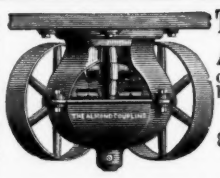

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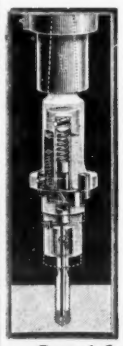

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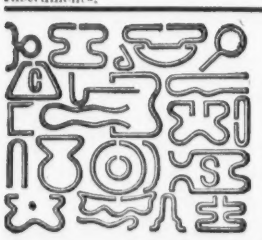

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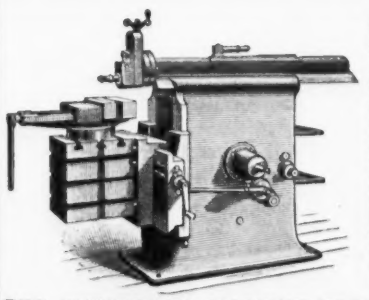

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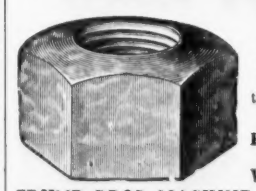

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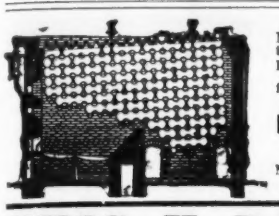

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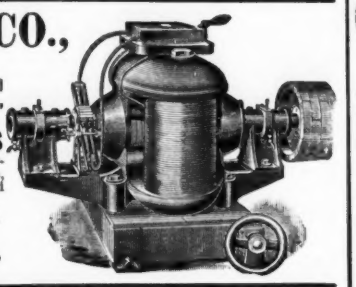

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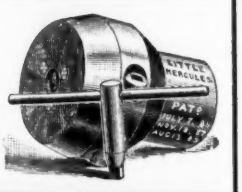

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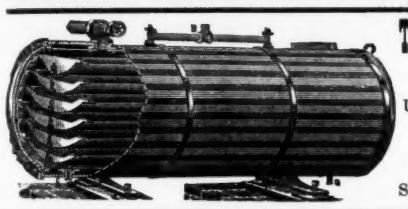

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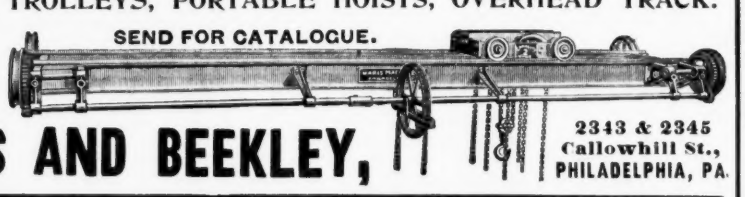

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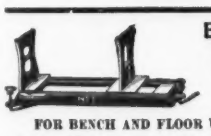

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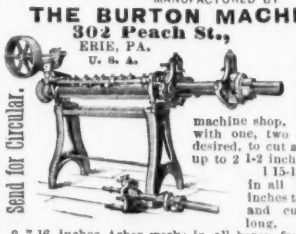

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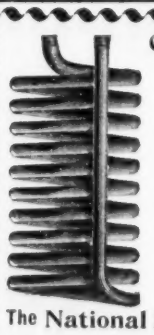

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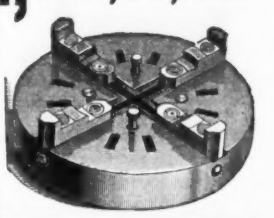

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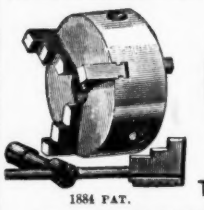

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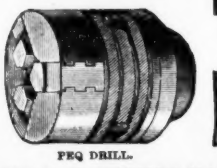

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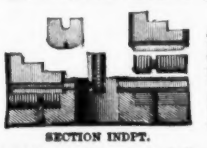

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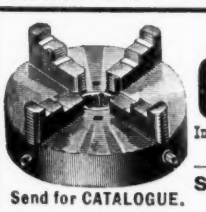

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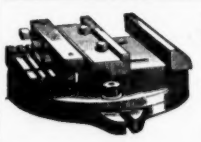

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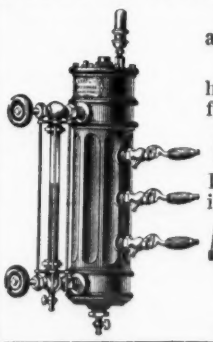

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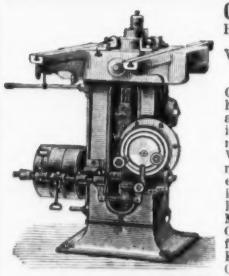

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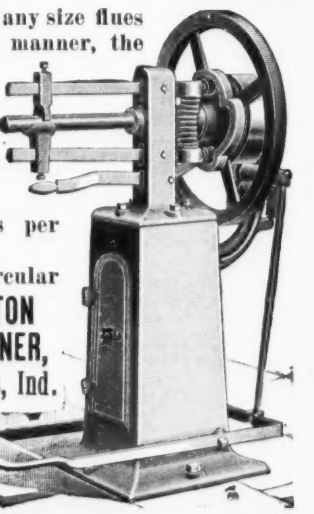

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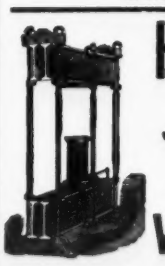

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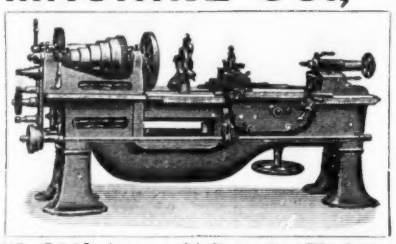

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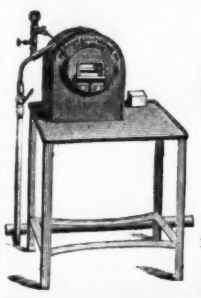

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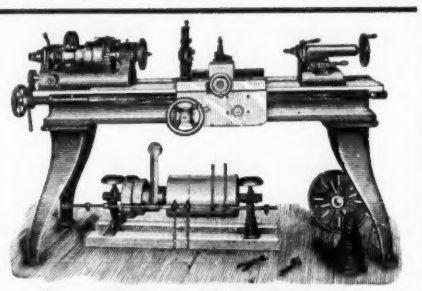

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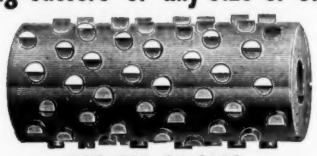

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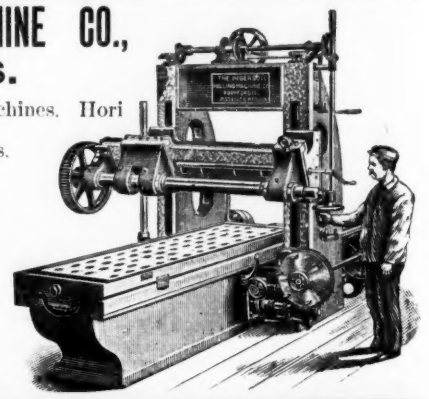

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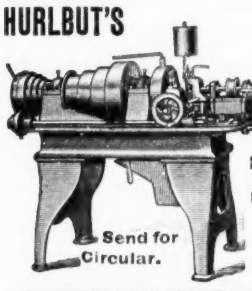

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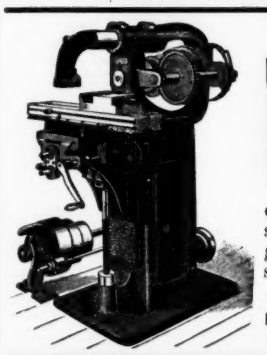

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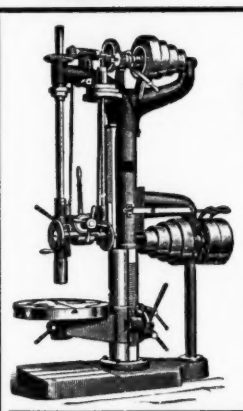

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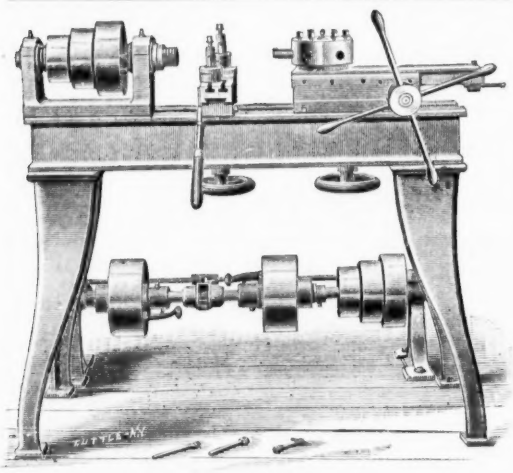

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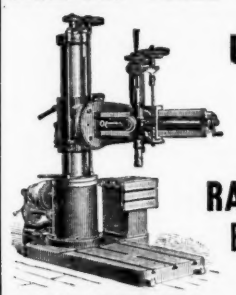

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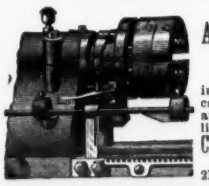

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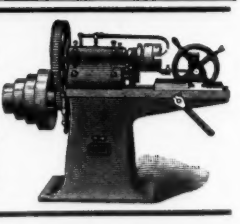

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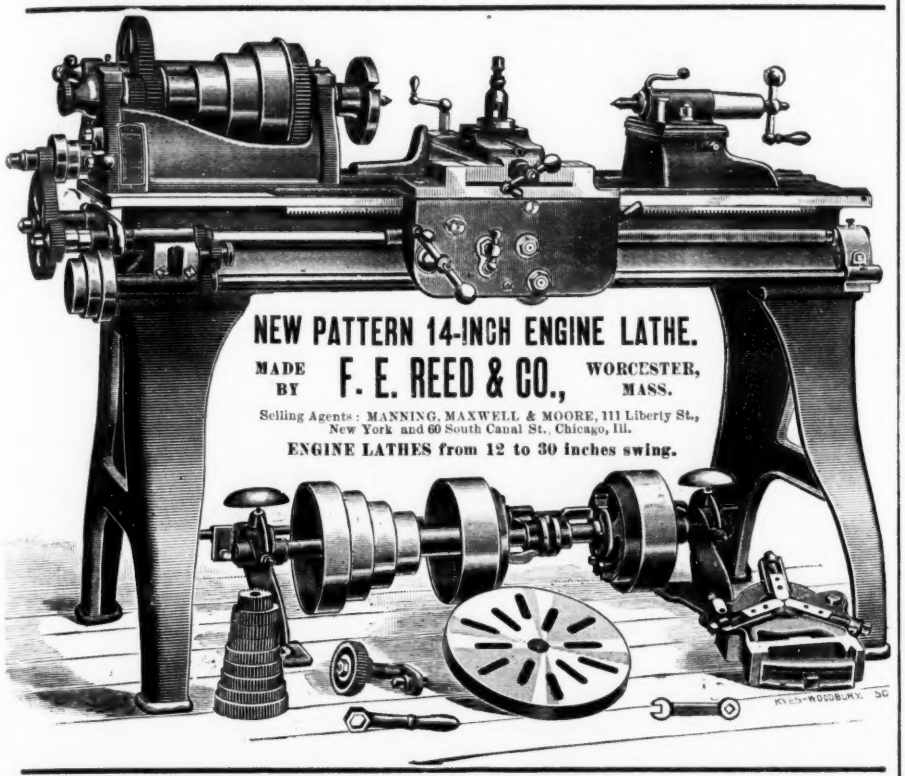
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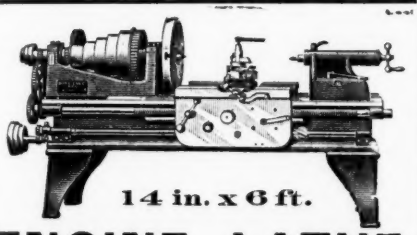

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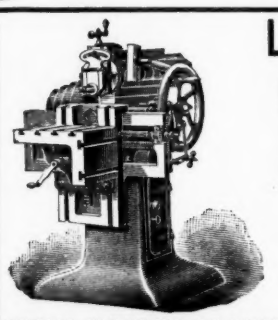

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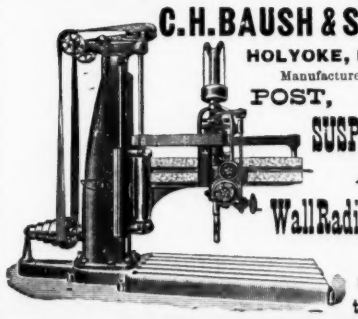

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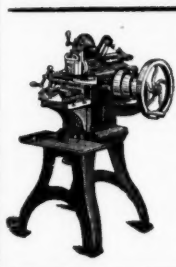

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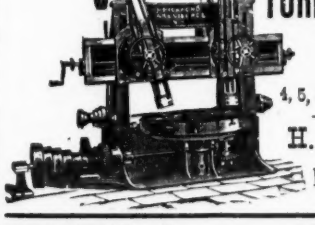

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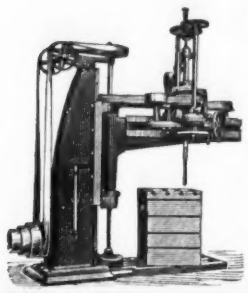

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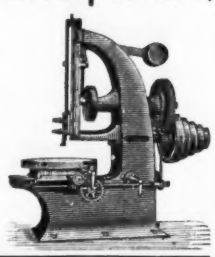

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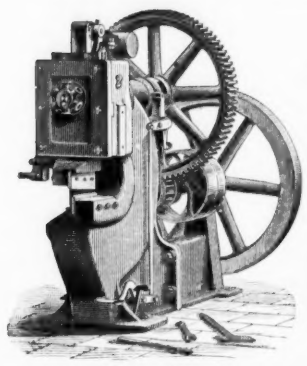

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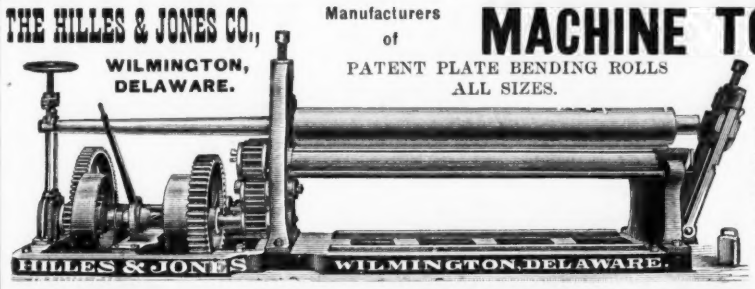

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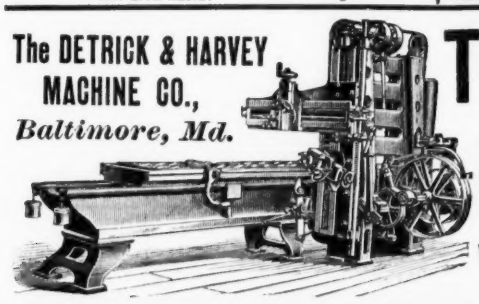

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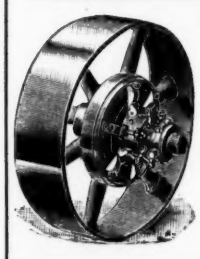

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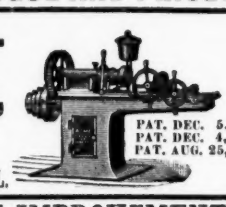

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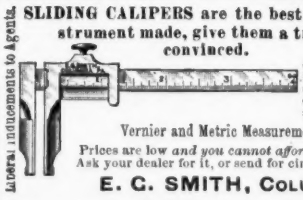

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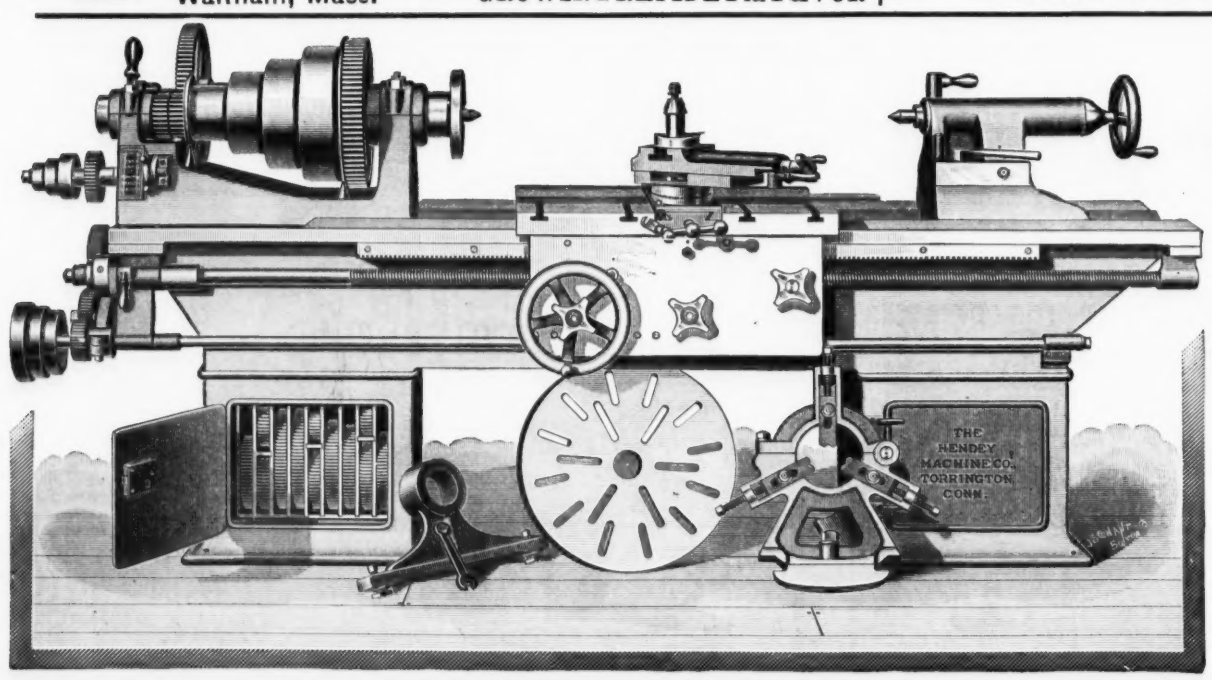

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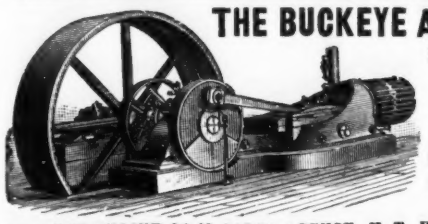

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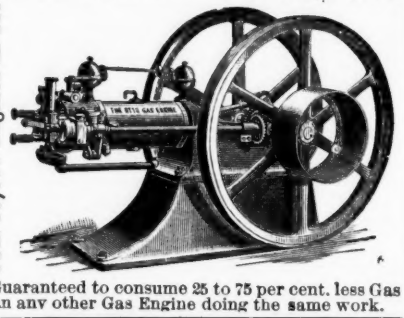

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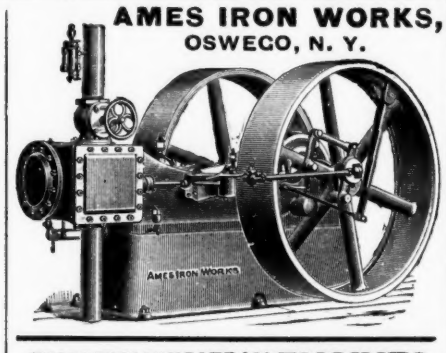

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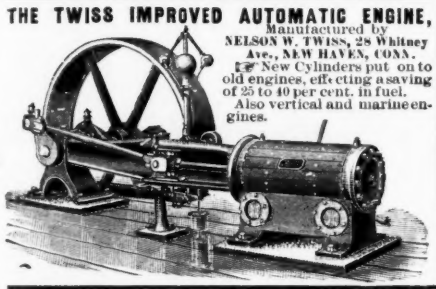

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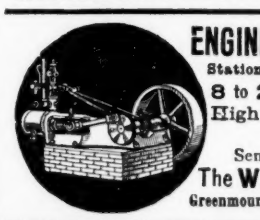

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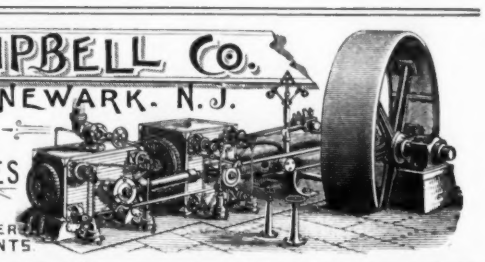

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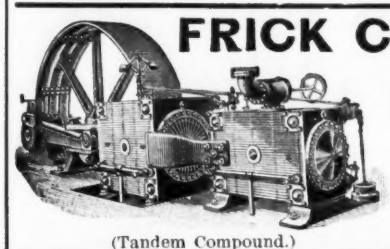

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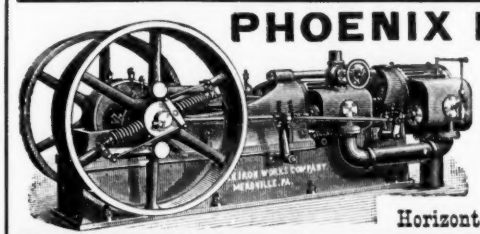

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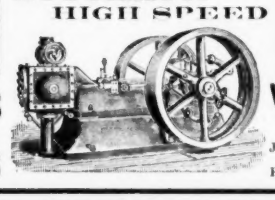

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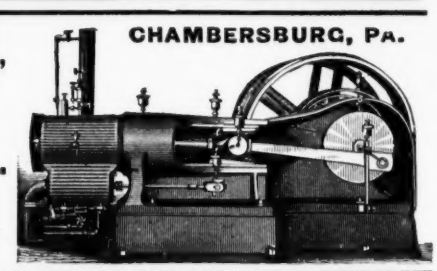

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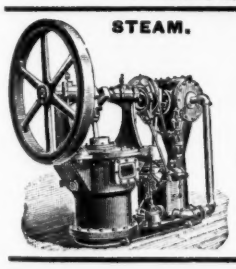

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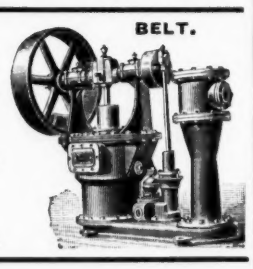

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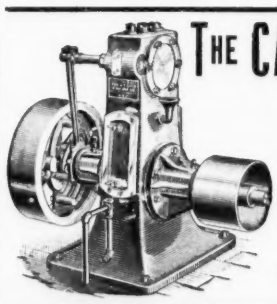

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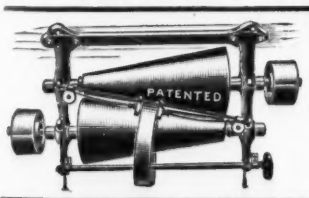

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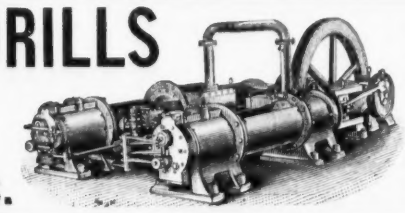

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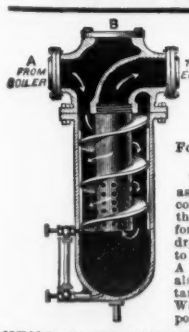

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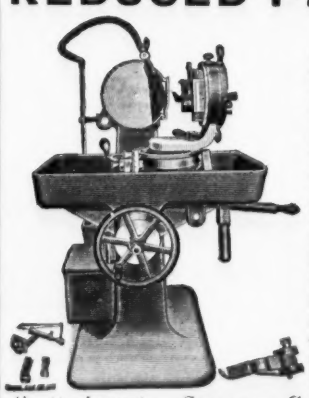

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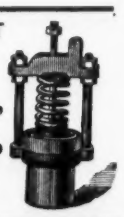

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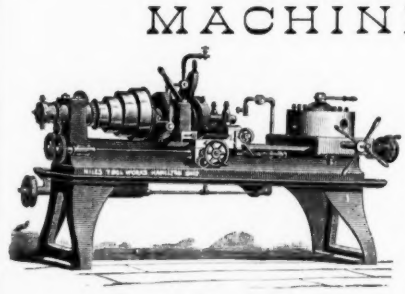

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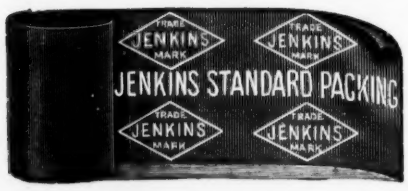

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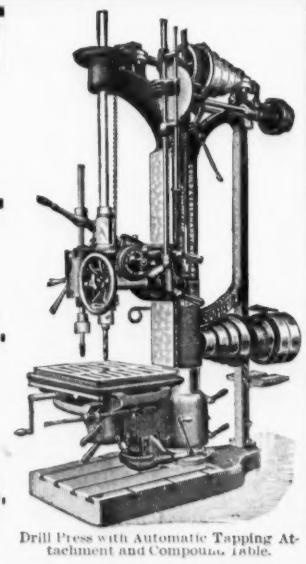

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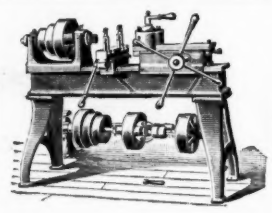

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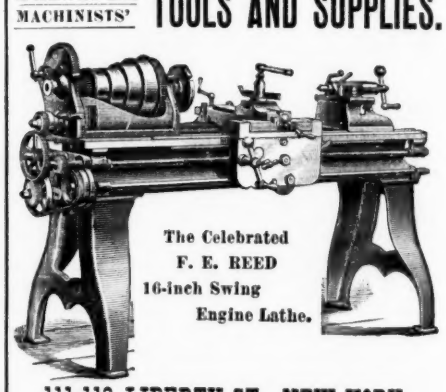

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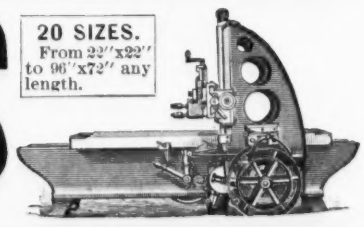

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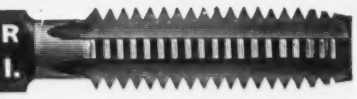

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